An investigation of the influence of information technology on audit risk: an empirical study in Saudi Arabia

AN INVESTIGATION OF THE INFLUENCE OF INFORMATION TECHNOLOGY ON AUDIT RISK: AN EMPIRICAL STUDY IN SAUDI ARABIA

By

Abdullah Muhammad Al-Fehaid

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My Wife

For her Patience, Encouragement and Understanding.

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My Daughters, Raheel and Rama

For their Goodwill and Understanding.

ABSTRACT

The impact of the adoption of IT-based accounting systems on the audit function and the potential risks that are associated with auditing in such an environment have been recognised by the literature relating to developed countries. However, the direct impact of these risks on the level of audit risk in an IT-based accounting environment has not been investigated. Accordingly, this study attempts to fill this gap by investigating empirically the impact of the adoption of IT-based accounting systems on the level of audit risk in a developing country, namely Saudi Arabia (SA). In particular, it seeks to explore whether the level of audit risk has increased or decreased after the adoption of these systems by auditors' clients.

Due to the lack of literature relating to auditing IT-based accounting systems within the Saudi context, and also because of the lack of a theory which can be utilised to examine the impact of the adoption of such systems on the level of audit risk in a developing country like SA, the grounded theory (i.e. inductive) approach was employed to establish a theoretical model for this study. The study started with a review of the literature which covers this issue in developed countries. Then interviews were carried out with some representatives of audit firms in SA with the objective of collecting data to obtain insights into the experience of these firms regarding the audit of such systems. The findings from the literature study and the interviews were combined to develop a theoretical model for the purpose of elucidating the variables that were thought to have an influence on the level of audit risk in an IT-based accounting environment in SA. Finally, a questionnaire was used to test this model in order to support or refute theoretical propositions.

The findings supported the study's theoretical model of the variables that influence the level of audit risk in an IT-based accounting environment in SA. In particular, the results supported the expected relationships among variables as depicted in the model of the research. Finally, in the light of the findings of this research, it can be concluded that the adoption of IT-based accounting systems by clients of audit firms in SA has contributed to a possible increase in audit risk. This can be explained, on the one hand, by the existence of some risks in the clients' IT-based accounting environment such as clients' accounting software which is often unsuitable, clients' staff are often insufficiently competent in dealing with IT-based accounting systems, and also clients' internal control systems in such an environment may be weak. On the other hand, there appear to be a number of audit firms which are insufficiently qualified to audit in an IT-based accounting environment. Problems identified included firstly, applying an unsuitable audit approach when examining the reliability of IT-based accounting systems, and secondly, a lack of competence in auditing such systems.

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LIST OF ABBREVIATIONS

AAA	American Accounting Association
CAATs	Computer-Assisted Audit Techniques
AICPA	American Institute of Certified Public Accountants
APB	Auditing Practices Board
CPU	Central Processing Unit
CPA	Certified Public Accountants
CSI/FBI	Computer Security Institute / Federal Bureau of Investigation
DBMS	Database Management System
DOZAI	Department of Zakat and Income
EDP	Electronic Data Processing
ISBS	Information Security Breaches Survey
IT	Information Technology
MOC	Ministry of Commerce
PC	Personal Computer
SA	Saudi Arabia
SAA	Saudi Accounting Association
SAC	Systems Auditability and Control
SAS	Statement of Auditing Standards
SOCPA	Saudi Organisation for Certified Public Accountants
SR	Saudi Riyal
UK	United Kingdom
USA	United States of America

CHAPTER ONE

INTRODUCTION

1.1 Foreword to the Chapter

Competition, financial pressure and, more recently, globalisation has pushed businesses to harness, among other things, the benefits of information technology[1] (IT). Organisations in Saudi Arabia (SA) are starting to embrace the use of IT. One way that businesses have utilised this is by using IT to process their financial information. Consequently, this study seeks to examine the impact of such developments on audit risk in SA.

The aim of this chapter is to introduce the research problem undertaken in this study. For this purpose, the chapter includes the following sections: Section Two provides a background to the research problem; Section Three includes a statement of the research problem; Section Four sets out the aim and objectives of the research; Section Five highlights the importance of the study; Section Six outlines the structure of the thesis; and the last section provides the chapter's summary.

1.2 Background to the Research Problem

The revolution which has taken place in information technology is one of the most important forces that has changed the business environment in recent years (Hollander, 1996). Nowadays, IT has been made available even to small businesses as a result of the development of microcomputers (Taylor and Glezen, 1994). The introduction of this

[1] Information technology was defined by Monk (1991, p. 21) as "*the technology of automated information processing and communication*".

information technology into accounting systems creates what is known as computerised accounting systems or IT-based accounting systems (Lanier, 1992; Hickman, 1994)[2]. The introduction of these computerised systems has resulted in accounting systems becoming more complex and more powerful (Taylor and Glezen, 1994).

The change of accounting systems from manual to IT has also impacted on audit approaches (Hollander, 1996). This has resulted from the tremendous impact of computer technology on the way in which accounting information is processed and has lead to a reassessment of audit techniques. In addition, the loss of visibility of the audit trail and the shift of the physical control of data processing from a centralised department to an end user present new risks posed by advancements in IT (Vasarhelyi and Lin, 1988). The impact of such IT-based accounting systems on the audit function has created the need for auditors to be familiar with the nature of IT and have the ability to cope with its rapid development in order to understand the client's accounting systems and analyse their associated risks (Bell et al., 1999). In particular, auditors need to be aware of the absence of available independent outside evidence to support transactions (Cosserat, 2000). Also, they need to be aware of the lack of evidence of authorisation for transactions and the visibility of the trail to the human eye (Bell et al., 1998).

The increased use of IT-based accounting systems by audit clients has given rise to the question of the capability and competence of audit firms in this new environment. This question focuses on the issues of the competence of the auditors and also the sufficiency

[2] Both terms are used. However, in recent years, the term "IT-based accounting systems" has dominated. Accordingly, the term "IT-based accounting systems" will be used in the ensuing discussion. Its definition is provided in Chapter Three (Subsection 3.2.1).

of their audit techniques and methods that are used to deal with the features of this new environment. The importance of these issues increases in this environment since many traditional audit aids, such as the notion of the separation of duties, cannot always exist (Cosserat, 2000). This new situation has stimulated some writers (e.g. Williams, 1991; Bell et al., 1998 and 1999; Debreceny and Gray, 1999; Higson, 2002) and some professional bodies to investigate the impact of the advent of IT-based accounting systems on the audit function. Among these writers are Bell et al., (1998, p.14) who stated that "*Auditors are increasingly concerned about the implications of information technology for assessing risk and planning the engagement. IT has a direct impact on control risk and may preclude the auditor from performing a purely substantive audit*". In addition, Woolf (1997, p. 403) summarised the implications of the introduction of the computer into accounting systems for the profession. These were:

a- The way in which accounting data are recorded.

b- The way in which such recording must be controlled and authenticated.

c- The training needs and attitudes of the staff responsible, at both management and technical levels.

d- The way in which the process and its results must be audited.

In Saudi Arabia, the IT environment can be considered to be in its infancy when compared to developed countries like Japan, the United Kingdom (UK) and the United States of America (USA). However, the IT environment in SA has changed remarkably during the 1990s (Al-Turki and Tang, 1998). The utilisation of IT in SA was among the first in the region. Despite this, many Saudi organisations were hesitant to invest in buying computers due to the lack of Arabic software to run and operate these machines (Al-Turki and Tang, 1998). Now the situation is completely different as large

international computer companies have responded to the call for Arabisation. This Arabisation of computer software has played an important role in the increase of computer adoption by small and medium organisations in the Saudi private sector (Al-Turki and Tang, 1998). In addition, in April 1997, the Saudi government officially allowed access to the Internet. It is expected that the investment of Saudi organisations and individuals in this field will be the biggest in the region (Al-Turki and Tang, 1998). All of these changes in the IT environment in Saudi Arabia have affected the level of adoption of IT-based accounting systems in organisations and also the necessary requirements that should exist in audit firms to cope with these changes.

1.3 Statement of the Research Problem

The discussion above indicates that the introduction of IT-based accounting systems has significant implications for business organisations and audit firms. These implications focus on how organisations and audit firms deal with the requirements and the potential risks of these new systems. In Saudi Arabia, there is the pressing question of how the audit firms deal with IT-based accounting systems[3]. In a wider sense, it is questionable whether audit firms are capable, in terms of their approaches and also the ability of their staff, to audit such systems in a sufficiently rigorous way. The major point in this debate is whether the level of audit risk has increased after the adoption of IT-based accounting systems by organisations in SA.

1.4 The Aim and Objectives of the Study

The aim of the research is to investigate the possible impact of the adoption of IT-based

[3] For this purpose, a conference was held at King Saud University in Saudi Arabia in April 2002 and the researcher presented a paper at this conference. The conference title was "The Impact of Changes and Developments in IT on the Accounting and Auditing Profession in Saudi Arabia".

accounting systems by audit clients in Saudi Arabia on the level of audit risk. In particular, this study focuses only on those variables that could contribute to the level of audit risk, and at the same time, relate directly to IT-based accounting systems.

The most specific objective of this work is to contribute to a better understanding of how the use of IT-based accounting information systems by companies affects the audit function in Saudi Arabia. It will explore the practices of and the opinions on how audit firms react to the increased adoption of IT-based accounting systems and also how they react to the potential risks that are associated with such systems. Therefore, the objectives can be articulated as follows:

1- A review of the impact of IT-based accounting systems on audit function.
2- The establishment of the risks that are associated with auditing in an IT-based accounting environment.
3- Empirical investigation of the current practice of audit firms in Saudi Arabia to obtain insights into how they deal with IT-based accounting systems. In addition, it seeks to explore the risks or obstacles that are facing them when auditing in an IT-based accounting environment.
4- An assessment of the possible impact of the risks that are related to auditing in an IT-based accounting environment in SA on the level of audit risk.

1.5 Importance of the Study

During the 1990s a large number of companies in SA have become computer-based (Al-Turki and Tang, 1998). There has been significant adoption of IT-based accounting systems by organisations aiming to harness the advantages of such systems. This adoption by clients has led to the creation of a new audit environment which has

different attributes from the traditional one. This new environment requires audit firms to have qualified staff who are able to deal with such systems and also to use an audit approach which is appropriate to such systems.

The importance of this study comes from the increased need to examine the real practice of audit firms in this new environment and how they react to both its requirements and its challenges in order to avoid, or even reduce, the audit risk. There is a need to examine the level of audit risk after the adoption of IT-based accounting systems by organisations in SA. This is because the author anticipates that the results of this study might be useful to the following parties (besides any contribution this study might make to auditing literature); firstly, to audit firms which have clients with IT-based accounting systems. In particular, this study might contribute in providing an insight into the risks associated with such an environment. Such an insight might help in reducing audit risk in order to improve the quality of audit in SA. Secondly, it may be useful to the regulator of the audit profession in SA (namely, the Saudi Organisation for Certified Public Accountants {SOCPA}). In a wider sense, this study will investigate the current practice of audit firms in an IT-based accounting environment and also seek to discover if any problems were encountered in applying the Saudi audit standard regarding auditing in an IT-based accounting environment that was issued by SOCPA in 1997.

1.6 Structure of the Thesis

The thesis has ten chapters (as illustrated in Figure 1.1). The first chapter gives an overview of the thesis, the identification of the research problem, the reasons for undertaking this research, and the importance of the study. The second chapter discusses

the development of auditing. It presents a historical perspective for the evolution and development of the audit profession. The last section of the chapter reviews the development in audit approaches and also examines the factors that have led to such development. The third chapter focuses on the impact of the introduction of IT-based accounting systems on the audit function. It reviews, among others, the audit techniques that are available to test the reliability of IT-based accounting systems, and also the efforts that were made by the professional bodies to govern the practices of auditors with special emphasis on the Saudi audit standard in this environment. The fourth chapter highlights the potential risks related to auditing in an IT-based accounting environment. Two sections at the beginning of the chapter provide an explanation of the concept of audit risk and its components. The fifth chapter presents the research methodology that has been adopted in conducting this study. It describes, among other things, the development of the research instruments, the population of the study and the procedures that were used in collecting and analysing data. The sixth chapter reports the findings of the preliminary study (i.e. the interviews). The seventh chapter derives and develops the theoretical framework that will be used to study the level of audit risk in the IT-based accounting environment. It integrates the results of the interviews with the literature reviewed in Chapters Three and Four. The statistical analysis and interpretation of the results obtained from questionnaires will be demonstrated in Chapters Eight and Nine. First, Chapter Eight provides a descriptive analysis and also seeks to discover if participants' perceptions differ from each other based on a number of demographic variables. Then the relationships among the variables, as articulated in the theoretical framework of this research, are examined in Chapter Nine. The last chapter (Chapter Ten) includes the study's conclusions, implications, limitations and suggestions for further research.

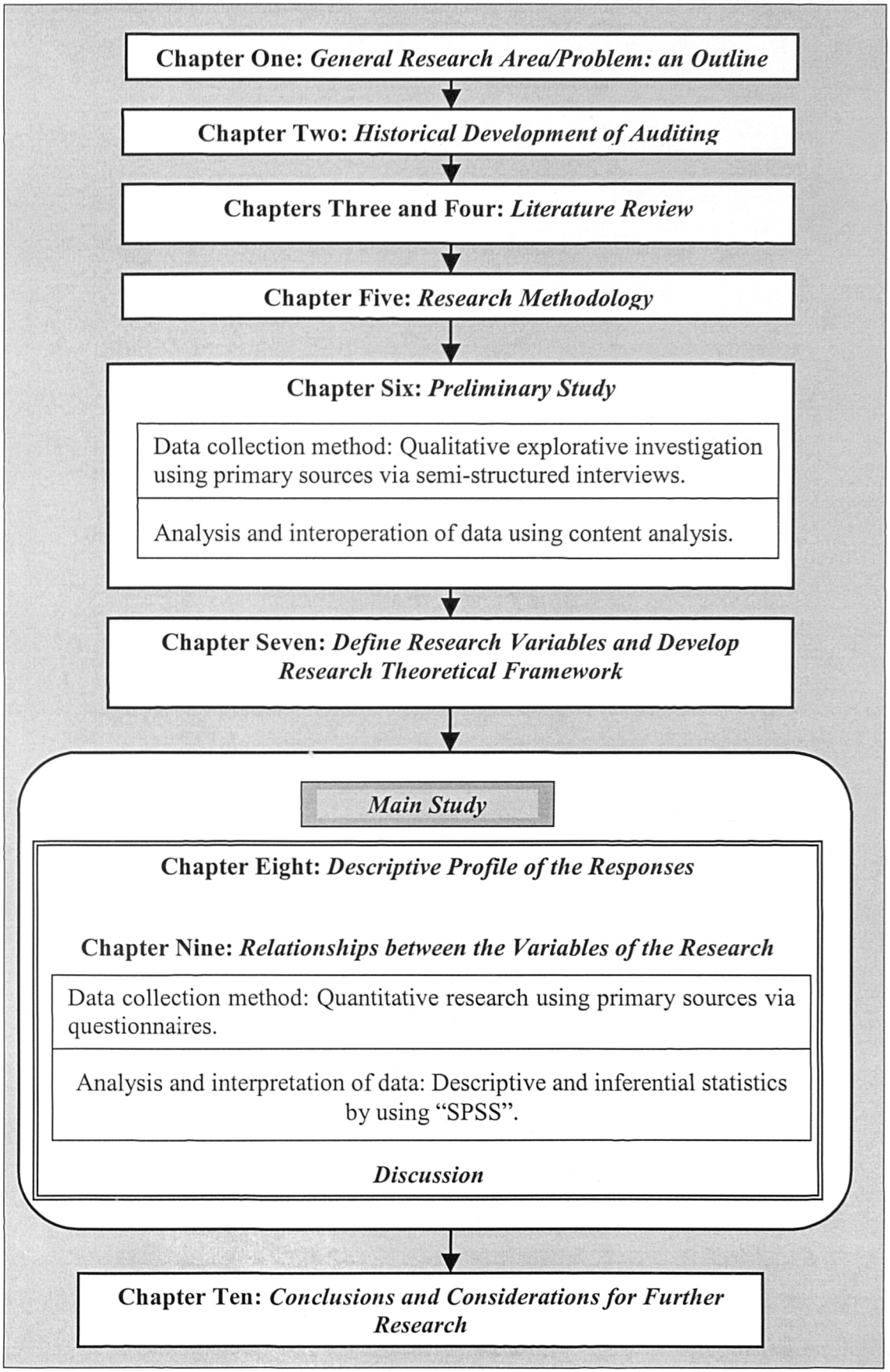

Figure 1.1 Overview of the Research Process and Chapters

1.7 Summary

This chapter was intended to provide a basis for the thesis and to give an introduction to the study. This introduction included outlining the research problem, specifying the aim and objectives of the study, and articulating the importance and expected contribution of this study.

Since the main subject of this thesis deals with the possible impact of the adoption of IT-based accounting systems by audit firms' clients on audit risk, it is worth, as a starting point, reviewing the factors which have had an influence on the development of auditing. This topic will be the theme of the next chapter.

CHAPTER TWO

THE DEVELOPMENT OF AUDITING

2.1 Introduction

Auditing is continually changing and developing in response to changes in the socio-economic environment. This development can be traced through a review of the history of auditing which provides a basis for analysing and interpreting the changes that have taken place in audit objectives and approaches. This has been emphasised by Lee (1988, p. XI) when he stated one professional historian's view which is: "*History is an adventure to discover and capture past realities and, by doing so, to provide an explanation of present realities in a continuum of developments*". The history of accounting and auditing (of one sort or another) goes back thousands of years. However, the modern audit of corporate organisations goes back to the early nineteenth century (Lee, 1993).

Auditing services have been changing remarkably over the years. In a wider sense, auditing has developed from what was primarily a check of the accounting for stocks and revenues by authorised officers into a sophisticated professional assurance service performed by independent accountants for their clients and other users of financial information (Cosserat, 2000). In addition, there have been a number of significant movements in the development of audit methodology especially during the second half of the twentieth century (Higson, 1997). Accordingly, the purpose of this chapter is to provide an historical perspective for the evolution and development of the audit. Moreover, it examines the nature of the changes in audit practices or methodology and

also considers what factors appear to be exerting an influence in the promotion of these changes.

This chapter is organised as follows: the next section explains the concept of auditing; the third section deals with types of audit activity and the auditor; the fourth section examines the factors that led to the evolution and development of auditing; the fifth section traces the development of audit approaches; the sixth section studies the factors that led to the developments in audit approaches; finally, section seven includes the chapter's conclusion.

2.2 The Concept of Auditing

The word "auditing" comes from the Latin word *audire* which means "to hear" (Cosserat, 2000). The word "audit" is derived in this way since, in ancient times, the accounts of an estate, domain or manor were checked by having them called out to those in authority by those who had compiled them (Woolf, 1997). However, in order to understand what an audit is and how it is conducted in the modern context, a more up to date definition is needed. A comprehensive definition of auditing was provided by the American Accounting Association's (AAA) Committee on Basic Auditing Concepts as follows:

"*Auditing is a systematic process of objectively obtaining and evaluating evidence regarding assertions about economic actions and events to ascertain the degree of correspondence between those assertions and established criteria and communicating the results to interested users*" (AAA, 1973, p. 2).

The word *assertions* that is mentioned in the definition of the AAA has special meaning in the audit since it refers to the representations by management that are embodied in

the financial statement components, records or systems.

2.3 Types of Audit Activity and Auditor

Audit may be classified in various ways according to the primary objective of the audit or the primary beneficiary of the audit (Porter et al., 1996). The following subsections deal with types of audit.

2.3.1 Types of Audit Activity

Auditing in a narrow sense can be classified according to the types of audit activity (or primary audit objectives) into three main categories (Taylor and Glezen, 1994). These main categories are:

2.3.1.1 Financial Statement Audit: The overall objective of a financial statement audit in the UK was provided by the Statement of Auditing Standards (SAS 100) as follows "*... to enable auditors to give an opinion on those financial statements, taken as a whole and, thereby, to provide reasonable assurance that the financial statements give a true and fair view and have been prepared in accordance with relevant accounting and other requirements*" (Cosserat, 2000, p. 19). In other words, the financial statement audit involves gathering evidence on the financial statement assertions of an entity in order to ascertain the adherence of these assertions to generally accepted accounting principles or another comprehensive basis of accounting. This type of audit is carried out by external auditors who are appointed by the shareholders of the company, or by equivalent proprietors of non-incorporated entities, whose financial statements are being audited (Dunn, 1996).

2.3.1.2 Compliance Audit: The purpose of a compliance audit is to determine whether certain financial or operating activities of an entity conform to specified conditions, rules or regulations (Cosserat, 2000). In this type of audit, the criteria against which certain financial or operating activities are compared may come from a variety of sources, such as a set of regulations established by management. This type of audit is performed by internal or external auditors who are appointed by, and report to, the appropriate authority (Porter et al., 1996).

2.3.1.3 Operational Audit: This type of audit falls within the broad definition of an audit. However, the criteria against which management's assertions are measured differ in an operational audit (Taylor and Glezen, 1994). The definition of operational auditing was provided by the American Institute of Certified Public Accountants (AICPA) as follows: "*a systematic review of an organisation's activities (or a stipulated segment of them) in relation to specified objectives for the purposes of assessing performance, identifying opportunities for improvement, and developing recommendations for improvement or further action*" (cited by Taylor and Glezen, 1994, p. 5). In other words, the objective of such an audit may be broad or may be narrow (Glaster, 1993).

2.3.2 Types of Auditor

Individuals who perform the audit are generally classified into three groups: external auditors, internal auditors, and government auditors (Cosserat, 2000). The following explains each one:

2.3.2.1 External Auditors: External auditors are registered auditors (UK) or certified public accountants [CPAs] (USA) and they are independent of the organisations whose

assertions or representations are being audited. They are qualified to conduct all the types of audit described in the previous subsections and they provide these service on a contractual basis (Cosserat, 2000).

2.3.2.2 Internal Auditors: Internal auditors are employees of the organisations that they appraise. This condition threatens the independence of internal auditors even though efforts have been made to reduce this threat, such as the possibility of internal auditors in some organisations reporting directly to the audit committee of the board of directors (Glaster, 1993). This type of audit is called internal auditing which was defined by the Institute of Internal Auditing (1978, p. 1) as follows: "*an independent appraisal function established within an organisation to examine and evaluate its activities as a service to the organisation*". In other words, the objective of internal auditing is to assist the management of an organisation in the effective discharge of its responsibilities (Woolf, 1997).

2.3.2.3 Government Auditors: These are members of local or state government units who audit various organisational functions for several reasons, such as reviews of efficiency and economy in the use of resources. The professional standards and guidance applicable to audits of government entities go far beyond those found in other types of audits (Taylor and Glezen, 1994).

It is worth mentioning that this research deals primarily with financial statement audits which are performed by external auditors who are practising members of the accounting profession.

2.4 The Factors that Led to the Development of Auditing

Like other professions, auditing exists to satisfy a need in society. Thus, audit objectives should be changed in response to any change in the needs and demands of society. Many writers (e.g. Brown, 1962; Hein, 1963; Lee, 1993; Higson, 1997; Al-Motairy, 1999; etc) have examined the factors that have assisted in the development of auditing. They pointed out many factors such as economic influence, business failure, regulations, and the advent of IT. In short, the development of auditing cannot be related to one or two factors. However, it is beyond the scope of this study to review all the various factors which have brought us to the present stage of auditing development. The following subsections describe briefly the development of the profession in developed countries (particularly, the UK and the USA) and also in developing countries (particularly Saudi Arabia). The main reason for focusing on the development of the profession in the UK and the USA is the use of British and American standards in many developing countries such as Saudi Arabia as guidance for setting their own standards (Al-Motairy, 1999). In addition, most of the audit methodologies applied in developing countries are more or less similar to those in developed countries because of the widespread nature of international accounting firms which are located in developed countries (Bavishi, 1985). Thus, the recognition of the factors that led to the development of the audit profession in developed countries should help in constructing a basic background for the present study.

2.4.1 The Factors that Led to the Development of Auditing in the UK and the USA

The traditional conformance role of auditing first appeared in the UK and USA during the 1840s (Boockholdt, 1983). However, the role of auditing has changed in response to

many factors that shaped the form of the profession in developed countries. These factors are the economic environment, statutory regulations, the accountancy profession, and business failure.

2.4.1.1 Economic Environment: It has been argued that the economic environment has had the greatest influence on the nature of auditing (Younkins, 1988; Lee, 1986). In a wider sense, the industrial revolution, which began in the late 1700s in England and slightly later in the USA, required a revolution in the nature of business entities. The emergence of large-scale industrial and commercial enterprises and the displacement of individual joint ventures by continuing corporations was noted in the period that followed the industrial revolution (Glaser, 1993). In the late eighteenth century, industrialisation created the need for financing and this created, in turn, the need for incorporation (Lee, 1988). This revolution was funded by small amounts of capital which were contributed by many people as well as by large investments from others, thus providing enough finance for such companies. This resulted in the separation of the management from the owners (shareholders). As a consequence, shareholders and lenders depend on financial reports which are audited by external auditors.

The share market in the eighteenth and early nineteenth centuries was unregulated and the rate of financial failure rate was high (Porter et al., 1996). In the UK, therefore, auditors became involved in corporate activity through the need to give confidence to the financial statements. In the USA, however, the introduction of auditors resulted from the supply of finance from the UK to fund USA railroads (Lee, 1988).

In the light of the above, the impact of the economic environment on the audit function

has been reflected by the separation of the management from the owners (shareholders) with the latter depend on the audited financial statement when they attempt to evaluate the efficiency of the management in using their resources.

2.4.1.2 Statutory Regulations: Incorporation was usually accompanied by statuary regulation and such provisions since the mid-nineteenth century have influenced the nature of the audit (Lee, 1988). To protect investors from collapses, the first statute in the UK was passed in 1844 entitled "*An Act for the Registration, Incorporation, and Regulation of Joint Stock Companies*" (Hein, 1963). The Act requires all incorporated companies to have their financial statements audited (Hein, 1963). The auditor was empowered to examine the company's balance sheet and was required to report to the company's shareholders (Lee, 1986). The auditor was not required by the Act to be independent of the company's management, nor a professional accountant (Hein, 1963; Lee, 1986). In 1856, the statutory provisions of the 1844 Act requiring compulsory audit were repealed. Instead of that Act, a provision was made giving the Board of Trade the right to investigate the financial affairs of a company if at least one-fifth of the shareholders, in number and value, invited it to do so (Lee, 1986).

Compulsory audits were reintroduced in the UK by the Companies Act of 1900. The auditor was still not required to be a qualified accountant, although the Act did recognise the need for the auditor to be independent from management (Lee, 1986). However, the responsibility for detecting fraud and error was transferred to the directors by the Companies Act, 1929 (Glaser, 1993).

In the USA, the most important factors that shaped auditing during the period from the 1900s to the 1960s were the following:

a) *The Corporation Tax Law:* The tax law of 1909 required a uniform calendar year end (December 31) reporting for all corporations. This caused the preparation of financial reports to occur twice a year rather than only once a year (Moyer, 1951).

b) *The Railway Act:* This act gave the president the authority to appoint a commission to investigate and report on federal regulation in the issuance of securities by interstate railway companies. The overall objective of the commission was to prevent issues of worthless securities (Committee, 1979).

c) *New York Stock Exchange:* Following the Stock Market collapse of 1929, an effort began in 1930 to consider of all the problems which were of common interest to investors, exchangers and accountants. In 1933, the Stock Exchange announced that audited financial statements must accompany listing applications which were made after July 1 of that year (Committee, 1979).

In the light of the above, the role of statutory regulations in both countries can be seen since these regulations demand that the financial statement must be audited and that the auditor should be qualified to do this task.

2.4.1.3 The Accountancy Profession: None of the developments in auditing could have taken place so easily without the establishment of the accountancy profession in the last half of the nineteenth century (Flesher, 1993). The development of an accountancy profession began first in the UK when organisations of chartered accountants were first formed in Scotland in 1853 and 1854. However, the establishment of what was the forerunner of the American Institute of CPAs (AICPA) was founded in 1887 (Flesher, 1993).

Professionally qualified accountants began to be used on audits in the mid nineteenth century (Flesher, 1993). This first took place in the USA in the 1890s (Lee, 1986). However, in the UK, it was not until the Companies Act of 1948 that the company auditor was required to hold a recognised professional accounting qualification (Lee, 1986). The corporate auditor is now expected in most situations to have substantial professional competence in a variety of related areas that affect the conduct of the audit and must be a member of a recognised professional accountancy body (Lee, 1993). The Companies Act 1989 in the UK tightened up this requirement and resulted in the development of registered auditors (Porter et al., 1996).

2.4.1.4 Business Failure: Little has occurred in the recent history of external auditing that was not brought about by some catastrophic event such as a lawsuit or a major fraud case (Flesher, 1993). For instance, the failure of the Royal British Bank in 1856 in the UK caused the setting up of the Prevention and Fraud Act in 1857 and the Joint Stock Bank Act in 1858. In addition, the Companies Act of 1879 was issued as a result of the collapse of the City of Glasgow Bank in 1878. The Stock Market crash in 1929 in the USA stimulated the federal government to regulate the securities market by the 1933 Security Act and the 1934 Exchange Act (Al-Rumaihi, 1997). More recently, the collapse of Enron and Worldcom resulted in the Sarbanes-Oxley Act of 2002.

The production of misleading financial reporting was the main reason behind many business failures as a result of the absence of formal regulations (Benston, 1975). Such financial crises stimulated the government and the profession in both countries (namely, the UK and the USA) to regulate financial reporting by setting accounting and auditing standards in an attempt to prevent future scandals.

In the case of Saudi Arabia, as a developing country, the situation is quite different. Examining the development of the profession in SA will be the subject of the next section.

2.4.2 The Development of Auditing in Saudi Arabia

The history of the auditing profession in the developing countries such as Saudi Arabia is short compared with that of developed countries such as the UK and the USA (Al-Rumaihi, 1997). However, before starting this section it is useful to define what is meant by the term "developing countries"[1].

2.4.2.1 The Main Attributes of Developing Countries: General speaking, there is no precise definition or fixed standard that can be used to classify a country as a developing country. However, there are general features (e.g. economic statistics, such as income per capita) which may be used for this purpose although some or all of these features could be found in a developing country (Lawrence, 1996). Despite of this, there is a considerable diversity in the stages of development that have been achieved among developing countries which makes them, therefore, a non-homogenous group. The main features of developing countries, as reported by Al-Rumaihi (1997, pp. 73-74), are as follows:

a) *The production sector is heavily dependent on agriculture and mineral resources;*
b) *Production is not only used for internal, but also for exporting purposes in order to gain funds for the purpose of buying power, accessible for the future acquisition of foreign goods and services;*

[1] Appendix 2.1 shows the countries that have been classified as developing countries by the United Nations.

c) The economies of these countries do not have comprehensive or productive industrial production sectors, but are in the process of transformation;

d) There is a high level of illiteracy and low levels of education;

e) The political system is dominated by a single party;

f) There is an absence of or a non-active stock market;

g) Wealth (ownership) is concentrated in an elite group of society;

h) There is heavy government involvement in the economy.

Generally, and in the light of the above attributes, the structure of the economy in such countries is different from those of developed countries and this may have implications for the regulations of the accounting profession. The main accounting problems faced in developing countries are: a shortage of fully qualified accountants, poor standards of education, accounting in the public sector is incompetent, accounting techniques are poor, accounting standards and their enforcement are given low attention, and finally, accounting systems of developed countries have been adopted (Lawrence, 1996; Hove, 1996). However, it is beyond the scope of this study to discuss all these problems in detail. It is worth noting that accounting in developing counties has received more attention from various interest groups in the last three decades (Al-Rumaihi, 1997).

The discussion will now continue by presenting the factors that led to the development of the audit profession in Saudi Arabia.

2.4.2.2 The Factors that Led to the Development of Auditing in Saudi Arabia:

Although the first audit firm in SA was established in 1955, the profession was not recognised legally until 1965 (Shinawi and Crum, 1971). This act (the Companies Regulation) required companies to appoint auditors (Al-Motairy, 1999).

A lack of corporations was the main reason for the absence of the auditing profession in SA prior to the 1950s, as stated by Al-Faisal (1992, p. 130): "*Until 1950, an accounting profession did not exist in Saudi Arabia because the business enterprises at that time were mostly proprietorships and partnerships. Corporations in Saudi Arabia were formed late in the 1950s*". Since then the profession has started to develop. According to Al-Motairy (1999), the main factors that led to this development in the audit profession in Saudi Arabia were the formation of the Saudi Accounting Association (SAA), the issue of the first professional standards, CPA regulation and the establishment of the Saudi Organisation for Certified Public Accountants. However, there are other factors which led to the emergence and then the development of the audit profession in SA, such as economic developments (oil revenues) and education. The following paragraphs focus on the main factors of the above:

A) Economic Developments: There is no doubt that the discovery of significant amounts of oil in SA during the second half of the twentieth century has changed the Saudi economy[2]. Oil revenues transformed the country from a poor to a rich nation, as stated by Presley and Westaway (1989, p. 44): "*That Saudi Arabia could embark upon this remarkable development and industrialisation programme is due to the financial strength generated by the oil industry. Higher oil prices in the early 1970s brought the financial means to build the economy and the government supplied the desire to develop*". This revolution led to growth in the number of large companies which are characterised by the separation of ownership (shareholders) and management (Moustafa, 1985). As a result, audited financial statements became important channels

[2] For more details of the Saudi economy, see Presley and Westaway (1989).

of communication between the management and both present and potential shareholders.

B) The Development of Accounting Education: Accounting education in SA started when the College of Commerce was established at King Saud University in 1959 (Al-Motairy, 1999). After this beginning, and as a result of the economic development in SA which affected almost all aspects of life, accounting education has reached a reasonable level. By 1990, there were five Saudi universities offering undergraduate programmes in accounting, three of them offering a Master's programme in the same subject (Elkharouf, 1985; Al-Faisal, 1992). However, accounting education in SA is still in its infancy and there are major efforts being made by universities to graduate qualified Saudi accountants for work in both the public and private sectors as well as in the profession itself. Thus, it has been argued (Al-Motairy, 1999) that the growth of accounting education may have played a part in demanding the better organisation of the audit profession in SA[3].

C) The Saudi Accounting Association: The Saudi Accounting Association was established in August 1981. The SAA emerged in response to a call for an accounting organisation by the first accounting conference[4] which was held at the Department of Accounting at King Saud University in March 1981 (Al-Motairy 1999). The broad objective for the SAA is to develop accounting thought in the country; however, it also has other important objectives. They are the following (as reported by Al-Motairy, 1999; p. 127):

[3] For more details of Saudi accounting education, see Al-Faisal (1992).
[4] The conference was called "Ways of Developing Accounting".

a) *To develop accounting thought in SA*

b) *To encourage the contribution of professional accountants in the development of accounting thought in SA*

c) *To facilitate the communication of ideas between the Association and other organisations concerned with accounting in SA as well as in other parts of the world*

d) *To provide advice and necessary research for the purpose of developing the profession of accounting.*

Although the SAA is an academic organisation with no power (or responsibility) to regulate, it has played an essential role in the formation of the professional organisation, The Saudi Organisation for Certified Public Accountants, in 1992 (Al-Motairy, 1999).

D) The First Professional Standards: The absence of local standards was the main reason behind using standards from overseas (particularly those of the USA, the UK and international accounting standards) as a guide for public accountants in SA (Al-Rumaihi 1997). One implication of this situation was the lack of uniformity in audit reports among audit firms (Al-Rehaily, 1992; Merei, 1985). This undesirable state of affairs during the seventies and the early eighties was described by Moustafa (1985, p.205) as follows: "*The accounting profession in Saudi Arabia has not achieved a fair degree of recognition as an institution. The profession has not kept pace with the complexity, diversity, and progress that has taken place in the Saudi economy. The Chartered Accountant Act is virtually void of auditing standards, ethical standards, or a code of professional conduct. What is included is very limited and is of a legalistic rather than professional nature*".

In response to this problem, the Ministry of Commerce (MOC) issued the first

accounting and auditing standards at the end of 1985 (Al-Motairy, 1999). However, it is worth noting that, at that time the MOC commissioned a local accounting firm[5] to develop these accounting and auditing standards, and not an auditing standards committee (Merei, 1985; Moustafa, 1985).

E) CPA Regulation and SOCPA: The results of research[6] conducted by Al- Yamamah Magazine (1989, 1990) showed that there was a need for the establishment of a professional organisation to control and supervise the profession (Al-Motairy, 1999). The issuance of the Certified Public Accountants Regulation (CPA Regulation) in November 1991 was the cornerstone to organising and regulating the auditing profession in SA. The most important characteristic of the new regulation was the call for the establishment of a professional organisation (later called SOCPA).

The Saudi Organisation for Certified Public Accountants emerged in the early part of 1992 to be responsible for the following (Al-Motairy, 1999, P. 136):

a) *Issuing and developing accounting and auditing standards*
b) *Preparing and managing SOCPA fellowship examinations*
c) *Developing a code of professional ethics*
d) *Establishing an appropriate quality review programme in order to ensure that the CPA implements professional standards and complies with the profession of the new CPA regulations*
e) *Organising on-going education programmes.*

[5] It is called "Al-Rashed Certified Public Accountants' Firm"
[6] Under the title "Public Accountants under the Al-Yamamah Lens".

It is worth noting that the regulating of the profession was the responsibility of the MOC prior to the emergence of SOCPA. However, this does not mean that SOCPA is an independent organisation; it is a governmental organisation under the supervision of the MOC.

This section had tried to shed light on the development (or evolution) of the audit profession in two developed countries (namely, the UK and the USA) and in the country which is under consideration (i.e. Saudi Arabia, and which is classified as a developing country). Now the discussion will proceed by examining, based on Western literature, changes or developments in audit practices or approaches in recent years.

2.5 Developments in Audit Approaches

Audit is not a static concept. Audit practices change in line with changes in the auditor's role, changes in the auditing environment, and changes in auditing technology (Higson, 1987; Cosserat, 2000). An examination of the auditing literature shows that the methodology of large audit firms has been examined in the past (Higson, 1987; Turley and Cooper, 1991; Higson, 1997; and Lemon et al., 2000). The literature reveals that auditors have made massive alterations to, and developments in, their audit methodologies (Higson, 1997). In addition, it revealed that there has been a uniform pattern of development over the last twenty years (Turley and Cooper, 1991). The development in audit methodology has been divided by Davis (1996) into four generations. The first-generation audit was described as "verifying transactions in the books", and this generation of audits may have ended during the late 1960s (Higson, 1997). The second-generation audit was described as "relying on the systems", where auditors were verifying and documenting the accounting systems with a distinct focus

on information flows and internal controls (Higson, 1997). In a wider sense, if the auditors found that the internal controls were reliable, they would reduce the level of substantive tests and vice versa (Turley and Cooper, 1991). The third generation of audit was described as "risk-based auditing" which involves the application of concepts of risk to the audit process (Higson, 1997; Turley and Cooper, 1991). The rationale behind the shift to this approach was the high cost of the assessment of the accounting system which, in turn, stimulated auditors to reduce their system of work and make greater use of analytical procedures (Higson, 1987). This approach appeared during the mid 1980s and continued during the first half of the 1990s (Turley and Cooper, 1991; Higson, 1997). Finally, the fourth-generation audit was described as "the investigatory audit", which means "audit people making judgements about audited people" (Higson, 1997, p. 201). This approach was described by Higson (1997) as possibly being the audit of motivations, and was also described by Lemon et al. (2000) as the business risk[7] approach. However, Higson (1997) discussed how much audit emphasis should be placed on these things rather than on the detail of the accounting records. In addition to these fourth generations, the call for "continuous audit" was considered to be the basis of the fifth generation of audit (Higson, 2002a; Higson, 2003). The increased trend to real-time reporting[8] was the reason behind the call for continuous audit. In a wider sense, providing information on a real-time basis to decision makers raised the question of its reliability and, in turn, it has given rise to the notion of "continuous assurance[9]" through a "continuous audit" (Higson, 2002a). The continuous audit was defined by the

[7] Business risk is "the risk that the audited entity will fail to achieve its objectives" (Lemon et al., 2000, p. 1).

[8] It is beyond the scope of this study to review the advantages and disadvantages of this type of report, for more details see, for example, Higson, 2002a and 2003; Shah and Higson, 1997.

[9] Continuous assurance was defined by the Elliott Committee (cited by Higson, 2003, p.108) as "*Independent professional services that improve the quality of information, or its context, for decision makers*".

Canadian Institute of Chartered Accountants [CICA] (1999, p. 3) as "A methodology that enables independent auditors to provide written assurance on a subject matter using a series of auditors' reports issued simultaneously with, or a short period of time after, the occurrence of events underlying the subject matter". Effective continuous audit requires a highly automated process that would require only the minimum of human intervention, most financial information exists in electronic form, and the existence of reliable and effective internal control systems in the client's environment (CICA, 1999; Rezaee et al., 2001). However, it is worthwhile mentioning that this development (i.e. continuous audit) was considered to be a long-term goal (CICA, 1999). The following subsections provide an overview of the significant developments in audit approaches.

2.5.1 Substantive Testing

Substantive procedures include analytical procedures, tests of details of transactions, and tests of details of balances (Cosserat, 2000). The objective of substantive tests is to test the "substance" of a particular entry in the financial statements (Higson, 1987). The early 1980s witnessed a swing away from a reliance on internal controls towards a more analytical review (Higson, 1997). The reason behind this was that auditors felt more confident about forming an audit opinion with a substantial level of detailed substantive audit tests (Higson, 1997; Turley and Cooper, 1991). This position was likely to produce much duplication of effort and over-auditing (Turley and Cooper, 1991). Thus, the combined effect of analytical review, a risk-based approach, and testing of controls, may be used to justify a reduction in the amount of tests of detail undertaken on most audit engagements although the testing that is done is likely to be more focused (Lemon et al., 2000).

2.5.2 Systems of Internal Control

In the 1960s and 1970s, auditors placed greater emphasis on the internal controls of their clients in order to obtain satisfaction regarding the structure of the system (Turley and Cooper, 1991). The reason for this increased emphasis was improvement in the accounting procedures, and also the increased number of qualified accountants who were working in industry which led to a general refinement in standards in accounts departments (Higson, 1997). Since the early 1980s auditors started to cut back their system of work and also their reliance on internal controls because the assessment of an accounting system is an expensive process and also because of the close involvement of management in the daily running of the business (Higson, 1987; 1997). However, new applications of this approach appeared in the 1990s by which auditors changed their focus from control procedures to the control environment (Higson, 1997). In a wider sense, the emphasis of the auditors moved from low-level controls which involved looking and testing the detailed entries in an accounting system to top-level controls (Higson, 1997).

2.5.3. Statistical Sampling

Under this approach, probability theory is used to determine sample size and to interpret the results without replacing judgement (Cosserat, 2000). In a wider sense, it provides a decision model within which auditors' judgements are used to agree on an acceptable level of detection risk and to test materiality and other variables which are the inputs (Cosserat, 2000). Then the model specifies the sample size and evaluates the sample results in terms of sampling risk and materiality (Cosserat, 2000). This approach appeared in the 1970s and was then used increasingly because of its advantages which include that of ensuring comparability across the firm (Higson, 1997). It also makes

those involved consider what they should be thinking about when selecting sampling (Higson, 1997). Despite these advantages, recent developments have indicated that this approach has now almost been eliminated, and it appears generally that there is a swing away from quantitative approaches to auditing (Higson, 1997). Though auditors may have claimed their approaches to be statistical, in reality this tended to be so only provided that no errors were found.

2.5.4 Analytical Review

Analytical procedures are consistent with the desire of the auditor to understand the entity's environment rather than simply prove the financial statement figures (Lemon et al., 2000). This objective has been reflected by the employment of analytical procedures to identify unusual variations and subsequently assist in determining the structure and direction of evidence collection (Higson, 1991; Turley and Cooper, 1991). These procedures could be carried out at the start of the audit at the planing stage and not just at the end. Since the early 1980s, there has been increased use of analytical auditing procedures as a source of evidence because of the advantages of this approach (Higson, 1987). These advantages include actually reducing the amount of substantive tests that should be performed, it was cheap and, most important, it should force the auditor to think about the implication of the results and, in turn, focus his/her efforts on the problem areas (Higson, 1997). In addition, this approach is very helpful in IT-based accounting systems which result in the loss of audit trail and additionally, such an approach gives the auditor some overall comfort (Higson, 1987). Besides these advantages, it is also claimed that the nature of analytical procedures has become more sophisticated because of the greater use of computer tools, broad based data sets and benchmarking against the relevant industry (Lemon et al., 2000). Despite these

advantages, there are some drawbacks of this approach, such as the fact that data which are necessary for an analytical review may not be available, and also the difficulty of interpreting the results and determining whether or not something was unusual (Higson, 1991).

2.5.5 Risk-Based Auditing

One of the most recent developments in audit approaches in the last twenty years has been the increased use of the concept of risk and risk measurement in the context of audit evidence decisions (Turley and Cooper, 1991). The importance of the application of the concept of risk to the audit process "*is that its concern is not with the choice of a particular strategy for collecting evidence per se, but rather with providing a criterion for making that choice and determining the overall direction of the audit work*" (Turley and Cooper, 1991, p. 15). In a wider sense, this approach places more emphasis on the risks that face auditors which include not only audit risk (the risk of a wrong opinion) but also commercial risk (the adverse consequences of an audit failure) (Higson, 1997). This has driven auditors to reassess the fundamentals of the audit in order to obtain audit effectiveness which can be defined as "an assessment of whether the audit approach is achieving its objectives" (Higson, 1997), as opposed to the concept of efficiency which essentially involves "the relationship between inputs and outputs in any process or activity" (Turley and Cooper, 1991). In other words, the objective of audit effectiveness is to establish whether something really needs to be done in order to express an audit opinion, but the objective of audit efficiency is to verify whether existing procedures can be carried out in a more cost-effective manner (Higson, 1997). Thus, auditors changed their focus onto the risks of the people who manage the business and general high level risks, i.e. business risk (Lemon et al., 2000).

2.5.6 High-Level Risks

This new approach was described as a "top-down" approach which means starting from the business and its processes and working through to the financial statements, rather than in the opposite direction where the business is essentially defined by the financial statements (Lemon et al., 2000). In a wider sense, this approach appears to be moving the auditor's focus further away from the detail of the entries in the accounting system to the people who manage the business (Higson, 1997). The top-down approach was supported by the continued advances in information technology that have resulted generally in more reliable data because it eliminated human errors and, in turn, IT gives more scope for audit effort to be devoted to higher level assessments (Lemon et al., 2000). Another justification for this new trend was reported by Higson (1997): the system can be often be examined by internal audit and then external auditors can review their work.

2.6 The Factors that Led to Developments in Audit Approaches

The previous section examined the recent pattern of change and development in audit methodology. This section deals with factors that appear to be exerting influence in the promotion of these changes. These factors include market pressure, complying with auditing standards and guidelines, and technological developments. Each of these sources of influence is discussed in the following subsections.

2.6.1 Financial Pressures and Audit Efficiency

Company management has exerted a lot of influence on audit fees during the last three

decades (Higson, 1997). Initially this was in situations where economic recession was leading to pressure on all costs, and more recently through the adoption of practices such as competitive tendering (Turley and Cooper, 1991). This trend increased competition in fairly stagnant markets and gives rise to the need for audit efficiency (Higson, 1997). Audit efficiency means structuring the audit process in such a way as to reduce levels of testing and, in turn, reduce the audit cost while maintaining audit quality (Turley and Cooper, 1991). In other words, pressure on audit costs encouraged a review to ensure that existing methods did not result in over-auditing at any stage of the engagement (Lemon et al., 2000). Therefore, audit efficiency has been driven by commercial concerns within audit firms rather than by a concern to improve the productivity of auditing per se (Turley and Cooper, 1991).

2.6.2 Complying with Auditing Standards and Guidelines

Auditors are required to comply with auditing standards and guidelines issued by the professional bodies in order to lend credibility to their performance[10]. The increase in regulations has led to adjustments to firms' audit manuals (Higson, 1997). Turley and Cooper (1991) argued that the regulatory regime provides more of an indirect influence on audit methods through promoting greater general awareness and emphasis on the audit process. However, it is worth mentioning that the influence of regulations on the audit firms' methodologies is less compared with the impact of market pressure and technological development (Turley and Cooper, 1991; Higson, 1997).

2.6.3 Information Technology

The developments in information technology have affected the audit firms'

[10] The definition of auditing standards is provided in Chapter Three (Subsection 3.4.1).

methodologies in two ways. The first is the role of IT in the administration of the audit. This concept is called audit automation which refers to the use of IT in the planning, controlling and recording of audit work (Manson et al., 1997). Audit automation has been defined by Williamson (1994) as "*The process of applying any IT based system to assist auditors in the planning, performance, control, completion and administration of audit work*". The assistance of IT in the administration of the audit systems has encouraged and facilitated the recent development of audit approaches, especially analytical review and sample selection (Higson, 1997). In a wider sense, auditors tend to consider that the use of a standard software package will reduce the control risk and, in turn, give auditors more time to focus their efforts on high-level risk (Lemon et al., 2000). Thus, it has been argued that information technology, in this context, is used by audit firms to improve audit efficiency (Manson et al., 1997). The second is the influence of IT on the actual conduct of the audit. This is driven by the adoption of IT-based accounting systems by clients of audit firms (i.e. changing the nature of clients' accounting systems). In particular, the use of IT-based accounting systems instead of traditional (i.e. manual) accounting systems to process accounting data has increased since the 1970s and this has led to changes in the way by which data are processed and maintained (Taylor and Glezen, 1994). Although the adoption of such systems by clients did not change the overall objectives of the audit, it changed the type of evidence collected and tests carried out (Turley and Cooper, 1991). This topic will be discussed in more detail in the following chapters.

2.7 Conclusion

This chapter has provided an overview of the historical development of the audit profession. In particular, it was intended to review the changes or developments which

have taken place in audit approaches, also pointing out the factors that have driven such developments.

There are numerous significant changes in auditing practices which have occurred in recent years. The general picture that emerges is one of evolutionary development dominated by the application of high-level risk and control and a decrease, by some firms, on their reliance on low-level risk and control, substantive tests and statistical sampling. In a wider sense, there is a swing away from quantitative approaches to the audit and towards auditor judgement. The rationale behind these developments or changes was financial pressure, complying with auditing standards and guidelines, and technological developments. In more detail, regarding the first factor (i.e. financial pressure), audit firms were concerned about competition and fee pressure which was exerted by corporate management. This position has driven auditors to reassess their audit processes in order to reduce the audit cost and, at the same time, collect a reasonable level of evidence through audit efficiency. The second factor was the increase in regulation and the need of audit firms to comply with them for legal and competitive purposes. The final factor behind this development was the increased harnessing of IT by audit firms and their clients alike. The latter (i.e. the change in the nature of clients' accounting information systems from manual accounting systems to IT-based accounting systems) is the main interest of this study. The next chapter will examine the impact of the introduction of IT-based accounting systems on the audit function.

CHAPTER THREE

IMPACT OF IT-BASED ACCOUNTING SYSTEMS ON AUDIT FUNCTION

3.1 Introduction

The accounting function is critical in the successful operation of the businesses since it provides individuals and groups both within and outside a business with relevant information for decision making (Moscove et al., 1997). Over the years, accountants have used many tools such as calculators to speed the task of keeping business records while still maintaining accuracy (Lanier, 1992). Although, the computer was found to be ideal for accounting applications by businesses in the 1950s, only the largest organisations could afford its cost at that time (Lanier, 1992). However, today the number of organisations whose accounting data are not processed by IT-based accounting systems are very few (Hollander et al., 1996). This development (i.e. the adoption of IT-based accounting systems by businesses) has changed the auditing environment and, in turn, changed the skills and methods needed to carry out the auditing process in such an environment (Hall, 2001; Taylor and Glezen, 1994; Cosserat, 2000). Despite this change, the overall objectives and scope of the audit remain the same (Turley and Cooper, 1991; Rezaee et al., 2001). In other words, auditors are still required to express their opinion as to whether or not the financial statements of the reporting entity give a true and fair view or present fairly the entity's financial position.

The purpose of this chapter is to investigate the overall influence of the adoption of IT-based accounting systems by clients on the audit function. In particular, it gives an insight into the major issues facing the external auditor when auditing such systems. In addition, it reviews the audit techniques that are available to carry out audit tests in such an environment. Lastly, it sheds light on the effort was made by the professional bodies to govern the practices of auditors in this new environment.

The reviewed literature in this chapter, which will form the background to the study along with Chapter Four, seeks to lay down some aspects related to the audit risk in an IT-based accounting environment and attempts to identify the key themes which will be explored throughout the study. This reviewed literature is western literature due mainly to a lack of literature that concentrates on developing countries, and which could contribute to providing a base for the present study.

This chapter is organised as follows. Following this introduction, the next section presents an overview of IT-based accounting systems. The effect of IT-based accounting systems on the auditor's evaluation of internal controls is discussed in section three. The fourth section deals with auditing standards related to the IT-based accounting environment. The final section includes the chapter's conclusion.

3.2 An Overview of IT-based Accounting Systems

This section aims to give an insight on the nature and features of IT-based accounting systems. To provide a basis for this discussion, this section begins with an introduction to the definition of IT-based accounting systems.

3.2.1 Definition of IT-based Accounting Systems

An IT-based accounting system was defined by Lanier (1992, p.548) as "*A set of organised procedures used to collect and record accounting data with the use of a computer*". Based on the examination of the words of this definition, it seems to lack precision (i.e. it is not inclusive) because it should include "processing" as well. Thus, the definition of IT-based accounting system can be revised to become as follows: "A set of organised procedures used to collect, record and process accounting data with the use of a computer".

It is worthwhile mentioning that there are two types of IT-based accounting systems. Theses two types are called integrated accounting systems and stand-alone accounting systems (Dodd, 1992; Lanier, 1992; Fardon, 2002). An integrated accounting system is defined by Lanier (1992, p.549) as "*A system in which two or more accounting modules*[1] *are used together and share information*". In other words, in such a system each module handles a separate function but also communicates with the other modules. In contrast, in a stand-alone system only a specific accounting function (e.g. payroll) is computerised. In particular, a stand-alone accounting system was defined as "*A system in which only one module is used*" (Lanier, 1992, p.550). The adoption of either an integrated accounting system or a stand-alone accounting system by a business depends, on among other things, the frequency of transactions, staff knowledge and skills, and the size of the business (Dodd, 1992; Lanier, 1992; Fardon, 2002). Blewett and Jarvis (1989) argued that integrated accounting systems can provide an effective solution even for small and medium-sized businesses.

[1] A module is a program which is written to perform only a specific accounting function such as accounting receivable processing and may be able to communicate with other modules (Lanier, 1992).

The above section provided a basic definition of IT-based accounting systems and has discussed the types that can be adopted by a business. This leads the study to consider the various types of accounting software that are available in an IT-based accounting environment. This is the subject of the next section.

3.2.2 Accounting Software

Generally speaking, accounting software is designed to follow manual accounting procedures as closely as possible. In other words, accounting software has been designed to emulate the manual accounting process (Lanier, 1992). For this reason, a number of different kinds of accounting software were created to fulfil the various needs of businesses, according to the type of accounting system adopted by the business whether integrated or stand-alone. However, it is possible to distinguish between two main types of accounting software. These are ready-made accounting software and specific accounting software. Attributes of these software packages are discussed below.

Firstly, ready-made accounting software has different names in the literature such as horizontal accounting packages, ready-written software, or off-the shelf packages (Blewett and Jarvis, 1989; Lanier, 1992; Fardon, 2002). Ready-made accounting software is designed for universal use. Accordingly, such software is designed to meet the needs of businesses with fairly standard accounting needs (Lanier, 1992). The definition of ready-made accounting software was provided by Lanier (1992, p.549) as "*Accounting programs which are designed to perform the accounting functions required in a typical business*". Such software has certain advantages such as it is extremely user-friendly and is relatively cheap (Blewett and Jarvis, 1989). However, the main drawbacks of ready-made accounting software include that such software is not

flexible enough to provide individual needs since it is a "standard" package (Blewett and Jarvis, 1989). In addition, the user of such software is dependent to an extent on the supplier which can be a disadvantage if the after-sales service is poor (Blewett and Jarvis, 1989).

The second type is specific accounting software. This type is also called, in the literature, a vertical accounting package or customized software (Blewett and Jarvis, 1989; Lanier, 1992). In contrast to ready-made, specific accounting software is written specifically for an organisation (Blewett and Jarvis, 1989). Specific accounting software was defined as "*Accounting programs which are designed to perform the accounting functions required for a business with specialized accounting needs such as a manufacturing business, a law firm, or a construction business*" (Lanier, 1992, p.550). In a wider sense, such software include special accounts and even special journals which fit a business and also may generate special reports to give feedback to management (Lanier, 1992). As a result, the main advantage of specific accounting software is that it fills the needs of some businesses which cannot be filled by standard accounting software packages. The only drawback of specific software is that writing such software is costly compared with ready-made software (Blewett and Jarvis, 1989).

One of the main issues related to accounting software packages is the reliability of such software. This issue will be discussed later in Chapter Four. It is worth, before proceeding, to discuss how that accounting data is handled by IT-based accounting systems, reviewing the development in computing processing which led us to this stage. The following subsection provides a brief view of the historical development of accounting data processing.

3.2.3 Development of Accounting Data Processing

Data processing is simply collecting, processing and distributing information to achieve a desired result (Hollander et al., 1996). The equipment and procedures by which this result is achieved constitute what is known as the data processing system (Hermanson et al., 1983). The developments in accounting data processing could be described through the changes from the manual accounting system to the IT-based accounting systems in the hardware[2] and the software of handling this data. However, the changes that have had a major effect on accounting data processing were the changes in the hardware for handling this data. These changes can be traced from manual to IT-based systems. The following subsections will describe these changes:

A) The First Stage: The Change from Manual to Mechanical Accounting Systems

A manual system is one in which source documents are posted by hand to sales, cash receipts and other types of journals (Porter et al., 1996). The auditor in this system can visually inspect the documents, journals and ledgers and then report the performance results of this inspection. Moreover, transactions can be traced starting from source document to journal, printed reports and vice versa (Watne and Turney, 1984). The change in this system has occurred through the introduction of a mechanical accounting system that utilises the data processing equipment such as bookkeeping machines and unit record equipment in order to ease the handling process of the accounting data (Hollander et al., 1996). However, the problem of this change was that the auditing process in this new system became slightly more complex than that in the manual system (Taylor and Glezen, 1994). The reason for this was that the type of tracing and

[2] "Hardware is the physical equipment associated with the system. The basic hardware configuration consists of the central processing unit (CPU) and its peripherals, which include various input and output and secondary storage devices" (Cosserat, 2000, p.346).

visual observation which was possible with a manual system becomes more difficult in the mechanical system because of the speed with which the equipment operates (Watne and Turney, 1990).

B) The Second Stage: The Change From Mechanical to Computer Systems

The change in this stage took place when the handling of accounting data was performed by the computer instead of mechanical machines and, more specifically, when these machines were replaced by electronic digital computers (Watne and Turney, 1990). The result of this change was an increase in the speed and accuracy of handling the accounting data. However, it has created new challenges, especially for auditors, such as the absence of an audit trail (Williams et al., 1997). The discussion will continue by examining how the accounting data are handled in IT-based accounting systems.

3.2.4 Handling Data in IT-based Accounting Systems

The accounting function often embodies recording, updating, retrieving and reporting on large volumes of transaction data and related information. Auditors must be familiar with computer files and data processing in order to understand how this information is handled in IT-based accounting systems (Cosserat, 2000; Moscove et al., 1997). The following subsections focus on the file types and processing methods in IT-based accounting systems.

3.2.4.1 Types of Computer Files

Data and processing instructions are stored in files which can take many forms, from program instruction files to word processing document files (Hollander et al., 1996). In

accounting applications, data are organised in transaction files and master files and also the data may be contained in databases (Cosserat, 2000; Moscove et al., 1997). Each one of these types of computer file concepts is explained below:

A) Transaction Files: These files contain activity data and they are the equivalent of journals in the traditional systems (Cosserat, 2000). In other words, these files contain details of individual transactions which are used to update master file accounts (Moscove et al., 1997). These transaction files are prepared for each batch of transactions in order to be processed in the batch processing systems while transaction files are not necessary in the real time systems but may be created for control purposes such as backup in the case of error (Cosserat, 2000).

B) Master Files: These are permanent files which contain the balance or statutes of entities and they are the equivalent of ledgers in traditional systems (Hollander et al., 1996). Master files which are updated by transaction files do not contain event or activity data. This updating of master files is achieved through applying the grandfather-father-son approach where the new update file is the son, the master file utilised in the updating run that produced the son is the father, and the previous master file is the grandfather (Moscove et al., 1997; Cosserat, 2000).

C) The Database: Computer files may contain duplicate information when accounting applications are developed independently (Cosserat, 2000). However, this problem is overcome by the ability to pool this information on a database. In a database, data are stored only once but they are shared and used by a number of different users for different purposes (Moscove et al., 1997). In other words, a database minimises data

redundancy. As a result of using a database, all relevant data about business events, financial and non-financial, are combined into a common information storehouse (Hollander et al., 1996). Users can access, use and modify this common information through database management systems (DBMSs) (Moscove et al., 1997).

3.2.4.2 Data Processing Methods

Data processing methods are the ways in which data are entered into and processed by the computer to update the related files (Cosserat, 2000). Basically, there are two methods for processing data as follows:

A) Batch Processing: Source documents in the batch processing method (also known as batch entry/batch processing) are created when the transactions occur and, in turn, data from source documents are periodically transferred to a medium such as magnetic tape that can be read by a computer program (Taylor and Glezen, 1994). In other words, transaction data in such a method may not be entered into the computer until some time after a business activity occurs and master files may be updated even later at a convenient time (Hollander et al., 1996). Some of the advantages of batch processing include its ability to generate batch or control totals before processing and the use of batch numbers as a transaction trail or processing reference (Cosserat, 2000). In addition, the traditional audit trail is more likely to exist in IT-based accounting systems using batch processing in printed form or only in machine readable form (Moscove et al., 1997). However, the use of this method has some disadvantages, one of which is that the master files cannot be updated until the batch data are accumulated. Another disadvantage is that the use of this method leads to delay in correcting processing errors

which are identified by edit routines[3] because the errors in source documents or those which are incurred in converting data into machine readable form must be completely recycled (Cosserat, 2000).

Auditors are advised to study applicable computer flowcharts in order to understand batch processing accounting systems (Taylor and Glezen, 1994). Computer flowcharts are diagrams of sequence, data flow and processing logic in information processing (Taylor and Glezen, 1994). Generally speaking, they embody firstly, a system flowchart that describes the sequence of major processing operations and the data flow to and from the files which are used in processing (Taylor and Glezen, 1994). Secondly, they contain a program flowchart which describes the sequence of operations and logic in a computer program (Taylor and Glezen, 1994).

B) Online Processing: Data from source documents in an online processing method do not need to be transferred to a machine-readable device in a separate operation before processing takes place (Taylor and Glezen, 1994). In other words, the computer input device is connected to the central processing unit (CPU) so that master files are updated as transaction data are entered and a file inquiry can be made at any time (Hollander et al., 1996). Basically, there are two types of online systems as follows:

i) Online Entry and Batch Processing: Individual transactions in this method are entered into the computer via a terminal as they occur. In other words, master files are updated whenever transaction data occur (Moscove et al., 1997). However, transaction data may not be present when a business activity occurs (Hollander et al., 1996). The

[3] "A computer edit program performs tests of the data on the transactions tape for accuracy, validity, reasonableness, and completeness. Exception reports are printed" (Taylor and Glezen, 1994, p. 443).

advantage of this method is that it allows the immediate detection and correction of most data entries because the data are subjected to certain edit or validation checks by the computer program at the time of entry and error messages are communicated immediately to the terminal operator (Cosserat, 2000). Another advantage is that it keeps the control advantages of batch processing which are batch control totals and batch reference numbers (Cosserat, 2000).

ii) Online Entry and Online Processing: Transactions in the online entry and online processing method (also known as real time processing) are entered as they occur and the master files are updated concurrently with data entry (Taylor and Glezen, 1994). One of the main advantages of this method is that master files are more current and this is a critical feature to those accounting applications that require very current information (Moscove et al., 1997). Contrarily, the major drawback of this method is that it is very complex and needs sufficient controls because of the possibility of erroneous or unauthorised file alterations in the master files from concurrent updates (Taylor and Glezen, 1994). Another disadvantage is the possible loss of part or all of the master files in the case of hardware failure (Cosserat, 2000).

It can be inferred, in the light of the above, that there are significant differences between manual accounting systems and IT-based accounting systems. Highlighting these differences is important especially for auditors. This will be the subject of the following section.

3.2.5 The Differences between IT-based Accounting Systems and Manual Accounting Systems

A consideration of the differences between manual accounting systems and IT-based accounting systems may contribute towards a better understanding of the nature and features of the manual and IT-based audit environments. In particular, it reveals the weaknesses and the strengths of each type of these accounting systems upon which the auditors should focus their efforts in order to obtain auditing objectives. In other words, there are essential differences between the manual and IT-based accounting systems which auditors should take into account, especially when they perform their tasks in an IT-based accounting environment (Rezaee and Reinstein, 1998; Gray and Manson, 2000; Taylor and Glezen, 1994). The most important differences that have been recognised are the following:

a) The human beings who operate manual accounting systems can react intelligently to various events that affect the organisation while IT-based accounting systems can only act in an apparently intelligent way if they are programmed to do so (Gray and Manson, 2000). This means that manual accounting systems are likely to be more flexible than IT-based accounting systems.

b) The traditional audit trails that are familiar in manual accounting systems are based on following records from the beginning to the end of the transactions while the audit trails in the IT-based accounting systems are based only on following the results of transactions (Taylor and Glezen, 1994; Cosserat, 2000). In other words, the audit trail may exist in IT-based accounting systems for a short period and only in computer readable form (Bierstaker et al., 2001; Williams et al., 1997).

c) Random errors associated with manual processing are much more numerous than those which are associated with IT-based accounting systems since IT-based accounting

systems always process items in the same way (Gray and Manson, 2000). However, systematic errors which do not exist in manual systems could be accidentally or deliberately built into IT-based accounting systems which will, in turn, arise automatically every time the programs operate (Rezaee and Reinstein, 1998).

d) Segregation of duties is a vital issue in the manual accounting environment. However, this often does not exist in the IT-based accounting environment (Cosserat, 2000). The reason behind this is that, in IT-based accounting systems, most of the time, one person performs accounting procedures that are usually performed by separate individuals in manual accounting systems.

e) The potential for observing errors or fraud in IT-based accounting systems is less than in manual accounting systems (Cosserat, 2000). This is because, in the IT-based accounting systems, data are stored in a machine-readable form rather than a visible form which could be deliberately accessed and altered through computer facilities on different sites (Wasik, 1991).

f) The continuous updating of the accounting data which is facilitated by the development of real-time systems in the IT-based accounting environment and which does not exist in manual accounting systems leads to difficulty in performing auditing procedures (Cosserat, 2000). In other words, before the auditor in IT-based accounting systems has finished reading and adding the balances in accounts receivable subsidiary ledgers, some of the balances may already have been changed.

g) Managers and auditors who deal with IT-based accounting systems can be provided with a wider and more up to date variety of information than those who deal with manual accounting systems (Taylor and Glezen, 1994). This may be used to supervise effectively the operation of the entity.

h) Transactions in manual systems are usually authorised before they are executed and recorded (Cosserat, 2000). However, this not always the case in IT-based accounting systems where some transactions are automatically executed and recorded without explicit management authorisation (Rezaee and Reinstein, 1998; Taylor and Glezen, 1994).

In the light of the above, it can be argued that the adoption of IT-based accounting systems by clients has reduced certain problems, such as human error. However, it creates new challenges or risks for auditors such as the possibility of errors in programming, the loss of the audit trail, and the lack of segregation between duties. The features of IT-based accounting systems and the risks associated with them have implications for auditors who audit in an IT-based accounting environment[4]. These implications are discussed in the following section.

3.2.6 The General Implications of Auditing IT-based Accounting Systems

Auditing IT-based accounting systems has several implications which are required to be fulfilled by the auditors in order to perform their tasks in an effective and efficient way. These implications are as follows:

3.2.6.1 Auditors' Knowledge and Experience: In the IT-based accounting environment, auditors are required to have sufficient knowledge and experience in the subject of IT in order to assure the integrity and reliability of IT-based accounting

[4] It is worth mentioning that more detailed discussion about the potential risks that are associated with auditing in an IT-based accounting environment is provided in Chapter Four.

systems (Bierstaker et al., 2001; Taylor and Glezen, 1994). Such knowledge is still important and required for auditors even if they have recourse to IT specialists in order to be able to direct, supervise and review the work of their assistants (Watne and Turney, 1990). In particular, auditors need to obtain reasonable assurance that the work performed by IT experts is adequate (Helms and Mancino, 1998).

3.2.6.2 Timing of Auditing Tests: One of the important decisions that the auditor must make when planning an audit in an IT-based accounting environment is the timing of the related tests in order to avoid losing the audit trail (Rezaee and Reinstein, 1998; Porter et al., 1996). This has been affected by the importance of the presence of the auditor for the data accounting process while it is taking place (Watne and Turney, 1990). The most important reason behind this is that when the auditor is not present while the accounting data is being processed, the auditor will lose the audit trail due to the creation of batch totals which give no breakdowns for checking purposes or for cross-referencing to original documents. (Rezaee and Reinstein, 1998; Woolf, 1997).

3.2.6.3 Accounting Information System Areas that should be Covered: In IT-based accounting systems, as opposed to conventional systems, no record is left for subsequent individual verification (Cosserat, 2000). Thus, the auditor has to concentrate his/her efforts on quality control over the input, the processing, the systems development controls, the administrative controls and the use made by management of output reports (Watne and Turney, 1990).

3.2.6.4 Audit Documentation: The auditors must understand the accounting systems and their related internal controls in order to make their audit plan (Chambers and

Court, 1991). The auditors' understanding of the accounting systems and internal controls should be documented (Cosserat, 2000). This documentation on the audit files must conform to the nature of IT-based accounting systems. In other words, standard questionnaires and checklists must be redrafted accordingly, and the current files must contain a record of all the client's data processing documentation (Bierstaker et al., 2001; Woolf, 1997).

3.2.6.5 Integrity of Programs: Auditors, in an IT-based accounting environment, should pay more attention to the accuracy and validity of the programming process than to those casual errors that are normally created in a manual system (Rezaee and Reinstein, 1998; Chambers and Court, 1991). The reason behind this is the lack of an audit trail in IT-based accounting systems which enable an auditor to trace the transactions from their source to the final report (Taylor and Glezen, 1994).

3.2.6.6 The Depth of Audit Tests: Auditors may have to extend substantive testing because the segregation of duties in the traditional form that auditors rely on in manual systems does not exist in IT-based accounting systems (Watne and Turney, 1990). In other words, the user in an IT-based accounting system can initiate and authorise transactions, and also control both the processing and distribution of the output (Cosserat, 2000). As a result, auditors may have doubts about the strength and the adequacy of controls and data in IT-based accounting systems and must, in turn, increase the substantive tests to reduce any potential risks (Taylor and Glezen, 1994).

3.2.6.7 Electronic Evidence: Accounting systems, including IT-based accounting systems, leave a trail of evidence that is important for several applications (Hollander et

al, 1996). However, the evidence of IT-based accounting systems usually stays for a short period of time (Helms 1999; Williams et al., 1997; Watne and Turney, 1990). This requires an increase in the auditors' IT skills and the use of computer-assisted audit techniques (CAATs)[5] in order to obtain sufficient electronic evidence that will enable them to test the reliability of internal controls in IT-based accounting systems (Helms and Mancino, 1998).

This section presented an overview of IT-based accounting systems. Now attention will be directed towards examining the impact of these systems on the auditors' evaluation of internal controls.

3.3 The Effect of IT-based Accounting Systems on the Auditor's Evaluation of Internal Controls

It is important for internal controls to be evaluated by auditors in both manual accounting systems and IT-based accounting systems in order to assess the risk associated with them (Cosserat, 2000)[6]. However, in IT-based accounting systems, the importance of these internal controls increases because of several reasons. These are, firstly, that the increased reliance by management on reports that are generated by the IT-based accounting systems leads to the importance of the accuracy and reliability of such reports (Taylor and Glezen, 1994). This is achieved by internal controls. Secondly, an increasing amount of organisational resources are being allocated to computerised

[5] The definition of CAATs is provided later in Subsection 3.3.5.3.

[6] Such a task is not necessary if the auditor plans to use a primarily substantive approach and assesses control risk at maximum. However, such a decision is not plausible since it increases the cost of auditing and, in turn, is not in line with the current trend in audit methodology towards audit effectiveness as discussed in Chapter Two.

activities and an effective control process is necessary to make sure that the resources are used effectively (Woolf, 1997). Thirdly, poor internal controls in an IT-based accounting environment have been seen as the main reason for creating control problems such as computer fraud, file insecurity problems and operating inefficiencies (Spaul, 1991; Bell et al., 1998). Management in an IT-based accounting environment is becoming increasingly aware of the importance of this through implementing a sound internal control framework to reduce any damage that may result from inadequate controls (Hollander et al., 1996). In addition, auditors are also becoming more aware of how important this is since the quality of the internal controls can have a significant impact on the audit (Cosserat, 2000).

The purpose of this section is to consider the impact of IT-based accounting systems on the nature of internal controls and also to review the methods used by auditors to verify the reliability of these controls. To continue this discussion, it is necessary first to define internal controls.

3.3.1 The Definition of Internal Controls

Internal controls have been defined by the Committee on Auditing Procedures of the American Institute of Certified Public Accountants (AICPA, 1949, p.6) as follows: "*Internal controls comprise the plan of organization and all the coordinate methods and measures adopted within a business to safeguard its assets, check the accuracy and reliability of its accounting data, promote operational efficiency, and encourage adherence to prescribed managerial policies*". The importance of internal controls for auditors is discussed in the next subsection.

3.3.2 The Importance of Internal Controls for the Auditor

Irrespective of the nature of the system, whether it be a manual accounting system or an IT-based accounting system, the auditor must obtain a detailed knowledge of the client's accounting system in order to evaluate the effectiveness of the internal controls (Cosserat, 2000). This evaluation reveals the reliability of the accounting system and the extent and depth of the audit tests which, in turn, lead to the presentation of an audit opinion on the financial statements (Bell et al., 1998). The auditor will feel fairly confident that financial statements are free of material misstatement if the internal control system is well designed and if it operates effectively to meet the internal control objectives (Hollander et al., 1996). However, the auditor will be less assured that the financial statements are free of material error if the entity's internal control system is poorly designed and is inefficient in meeting the internal control objectives (Hickman, 1997). Therefore, it may be argued that the quality of the internal controls has a significant impact on the auditor's task (Douglas, 1995). Accordingly, the auditors must have sufficient competence which enable them to evaluate these controls, particularly in IT-based accounting systems which have special features.

3.3.3 The Influence of IT-based Accounting Systems on the Internal Control System

The introduction of an IT-based accounting system will have a significant impact on an entity's internal control system. On the one hand, IT-based accounting systems have created opportunities for increasing the reliability of internal controls in an IT-based accounting environment since these systems, for instance, have consistent performance. These systems, on the other hand, expose internal controls to new risks that should be taken into account when evaluating the reliability of these controls in such an

environment. For instance, electronic communication (e.g. networks) permits personnel to contact and transmit accounting data through remote terminals or PCs (Porter et al., 1996). Accordingly, it can be argued that IT-based accounting systems have affected the traditional components of internal control systems (Cosserat, 2000). The following subsections highlight the features of IT-based accounting systems that have an impact on internal controls and which should be considered by auditors.

3.3.3.1 Concentration of Data Storage and Processing: In an IT-based accounting environment, the traditional notion of separation of duties that is needed to process the accounting data and that is important for sufficient internal control systems does not always exist (Cosserat, 2000). Porter et al. (1996) argue that when accounting data and records are stored and processed by a computer department it may lead to:

a) An increase in the portion of accounting errors while processing the accounting data because the knowledge of this department's personnel in the accounting field is weak.

b) An abuse of the IT-based accounting system since detailed knowledge of the relationship between the source data, its processing and its distribution as output may be known only by IT specialists.

c) An increase in the possibility of committing fraud because certain personnel perform the entries of all types of transactions.

From a control viewpoint, these elements definitely have implications for the IT-based accounting system auditors when they evaluate internal control systems. These implications concentrate on conducting more audit tests by harnessing the facilities of new technology (Hickman, 1997).

3.3.3.2 Loss of Audit Trail: An audit trail can be defined as a chain of evidence provided through coding, cross-reference and documentation connecting account balances and other summary results with original transactions and calculations (Taylor and Glezen, 1994). Therefore, the audit trail is valuable for management purposes and it is important for to the auditor when testing the system. The traditional concept of the audit trail as it is explained above does not always exist in IT-based accounting systems (Williams et al., 1997). The reason for this is that in many IT-based accounting systems, much of the accounting data is produced and stored on computer disks which makes it difficult to follow the transactions as and when they are taking place (Hickman, 1997). In addition, in advanced IT-based accounting systems, such as those on-line, a regular printout of all processed data may not exist or it may be available only in electronic form for a short time and be irretrievable after a specific period if backup files do not exist (Rezaee and Reinstein, 1998; Hickman, 1997). This, in turn, leads to insufficient accounting data documentation. As a consequence of these factors, there may well be a general absence of input and output documentation for the auditor to scrutinise. This situation of the audit trail in the IT-based accounting system may lead to a difficulty in testing internal controls (Helms, 1999; Williams, 1997; Taylor and Glezen, 1994).

3.3.3.3 Access to Data and the Vulnerability of Storage Media: There is greater potential for fraud in an IT-based accounting environment due to an unauthorised change to any programme or data file that ultimately affects the expenditure of funds; the programs and data files may constitute valuable assets themselves (Spaul, 1991). The possibility for perpetrating fraud increases as a result of rapid developments in IT-based accounting systems which have facilitated access and alteration of the accounting data through computer facilities at remote locations (Hickman, 1997). In addition, the

possibility of unauthorised access to data has been supported by the absence of adequate internal controls (Woolf, 1997). This may be increasing with the greater interconnectivity of business through the Internet.

There is no doubt that the costs of protecting data are cheaper than the loss of the data. However, nothing is likely to compensate for the loss of data which are not retained (Chambers and Court, 1991). In an IT-based accounting environment, computer hardware and records are vulnerable to atmospheric or environmental conditions, electronic and magnetic interference, and accidental damage (Woolf, 1997). Thus, such storage media are vulnerable to loss or destruction unless there are sufficient internal controls which carefully protect them.

3.3.3.4 Characteristics of IT-based Accounting Systems Processing: IT-based accounting systems have particular processing characteristics which have a specific significance for the auditor. A number of writers (e.g. Cosserat, 2000; Hickman, 1997; and Taylor and Glezen, 1994) have discussed the processing features of such systems. These include the following:

A) Constant Performance: The computer always processes items in the same way due to its mathematical ability (Hollander et al., 1996). This feature eliminates random errors and, in turn, auditors will derive greater assurance about the reliability of accounting data in IT-based accounting systems than in manual accounting systems (Bell et al., 1998). As a consequence, auditors may reduce the volume of audit tests in an IT-based accounting environment. However, if the IT-based accounting system is not correctly programmed, it will consistently process transactions and other data

incorrectly (Hickman, 1997). Thus, the consequences of errors in IT-based accounting systems can be more serious than the consequences of errors in a manual accounting system. In addition, the auditor should be aware of the dangers of programming fraud which permit a special transaction to be processed in a non-routine way while other transactions are processed correctly (Spaul, 1991). Therefore, auditors should test the reliability of IT-based accounting systems in order to ensure that they provide accurate valued output (Cosserat, 2000). In addition, auditors should pay more attention to the development of such systems (Porter et al., 1996).

***B) Detailed Records*:** Advanced IT-based accounting systems include the capability to produce completely up to date accounting records and a wide variety of information (Hickman, 1997). This feature may be used by management to supervise and review the operation of the entity more effectively (Cosserat, 2000). In addition, these timely reports and information are a considerable assistance to auditors in the performance of substantive procedures (Taylor and Glezen, 1994).

***C) Simultaneous Update of Multiple Accounts and Files*:** In IT-based accounting systems, especially online systems, a number of accounts and files update simultaneously by using computer capabilities (Bell et al., 1998). For instance, when a single sales transaction is input into the computer, the sales and debtors' accounts and perpetual stock records may all be updated automatically (Hollander et al., 1996). Therefore, the auditor should be aware of such simultaneous updating because, if a transaction is entered into the system incorrectly, it will cause errors in a number of different accounts (Taylor and Glezen, 1994). This in turn increases the importance of controls that should be convenient for such systems such as using online monitoring.

In summary, this section discussed the impact of IT-based accounting systems on the internal control systems. The discussion will now continue by presenting the types of internal controls which exist in an IT-based accounting environment.

3.3.4 Types of Internal Controls in an IT-based Accounting Environment

The overall objectives of internal controls, namely, to secure reliable accounting data and to safeguard the entity's assets, are not affected in the IT-based accounting environment (Hickman, 1997). However, many of the "traditional" internal control procedures employed in a manual accounting environment are not applicable in an IT-based accounting environment and alternative controls need to be designed and implemented (Hollander et al, 1996). The reason behind this is that the methods of processing used in IT-based accounting systems are different from those which apply to manual accounting systems and, in turn, the means by which control is achieved are different (Chambers and Court, 1991). In an IT-based accounting environment there are two types of internal control, as shown in Figure 3.1:

1- General (or environmental) controls

2- Application controls

In the remainder of this section these two broad categories of internal controls in the IT-based accounting environment are discussed.

3.3.4.1 General (or Environmental) Controls

General controls are designed to control the entire IT-based accounting environment including, among others, the development and maintenance of system software in such an environment (Porter et al., 1996; Taylor and Glezen, 1994). Such controls aim to

ensure that all programmed procedures operate satisfactorily and all the data are safeguarded (Cosserat, 2000). The following subsections present the types of general controls which are widely known:

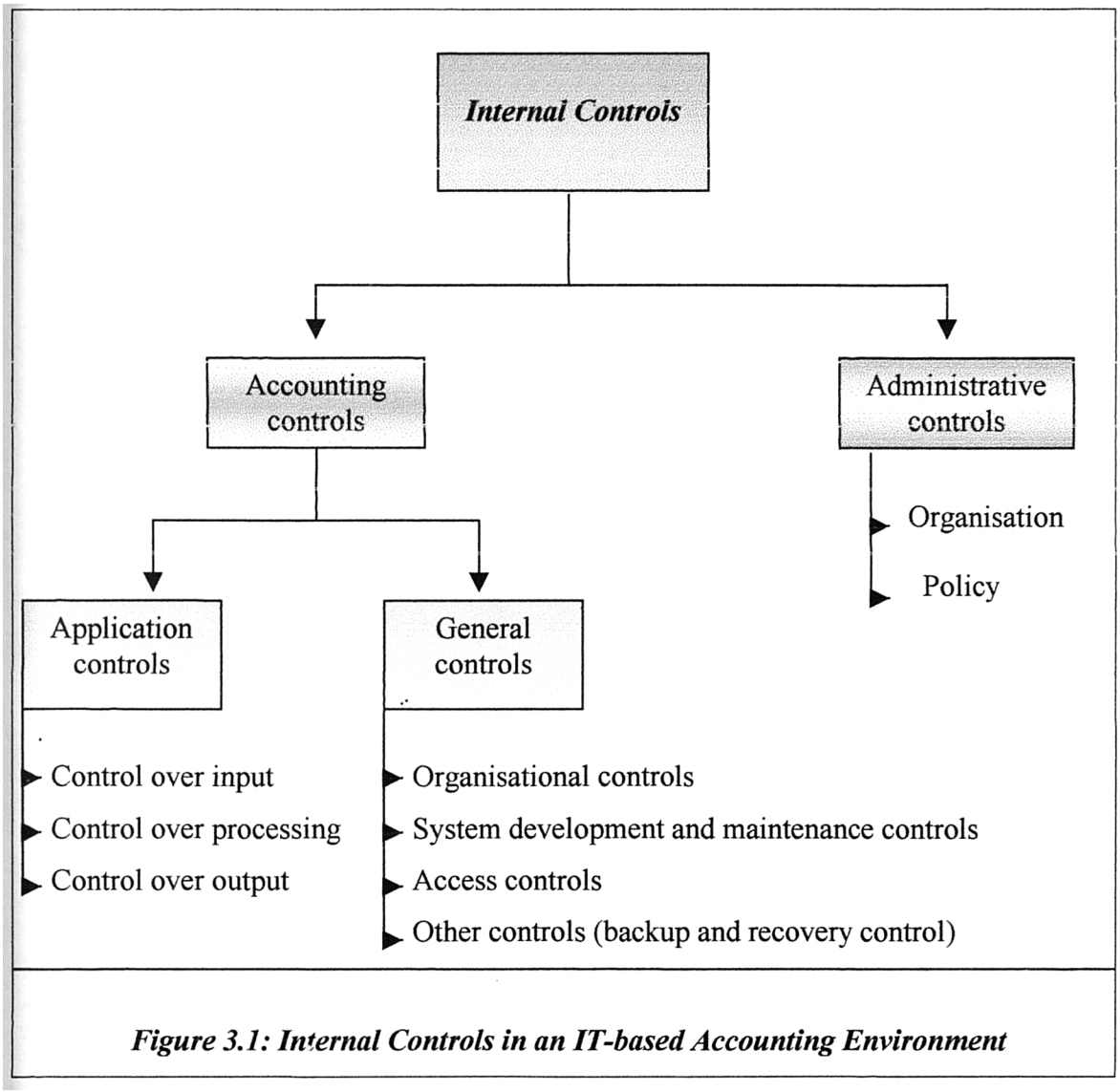

Figure 3.1: Internal Controls in an IT-based Accounting Environment

A) Organisational Controls: These are relevant to the management philosophy and operating style and to organisational structure control environment factors (Cosserat, 2000). Management in the IT-based accounting environment should ensure that there is a segregation between functions such as system design, programming, data maintenance and operations (Bell et al., 1998). This assurance can be achieved through sufficient policies and procedures that are exercised by management over the activities of the

entity and which may provide control over the computer function factors (Cosserat, 2000). In addition, this assurance could be supported by having a sound structure for the organisation which isolates personnel who know how the system is designed from those who process the transactions (Hollander et al., 1996). However, if the structure of the organisation does not take care of the segregation of duties, auditors will be unsure of the financial results produced by such systems.

B) Systems Development and Maintenance Controls: The system of organisation can be developed in-house by the organisation which will use it or by external specialists who work at arm's length from those who will use it (Chambers and Court, 1991; Taylor and Glezen, 1994). The reasons for this development include, among others, the poor control over their original development and subsequent maintenance, extension of the businesses, and harnessing the advantages of new technology (Chambers and Court, 1991; Hollander et al., 1996). These developments, or any modifications for the systems, are subject to certain controls which are related to the review, testing and approval of new systems, control over system and program changes, and documentation procedures (Cosserat, 2000). The documentation procedures include documents and records which are maintained by a company to describe computer processing activities. This documentation is important for both management and the auditors because it provides a foundation for management for reviewing and maintaining the systems, and training the user staff (Chambers and Court, 1991). Also it provides auditors with the primary source of information which reveals the flow of transactions through the system and the related accounting controls (Hickman, 1997). General speaking, auditors in an IT-based accounting environment are looking for good documentation and proper authorisation of all program modifications.

C) Access Controls: There is no doubt that unauthorised access to the system presents a tremendous risk to the enormous stores of valuable information being amassed by an organisation and preventing such access to the system is critical (Hickman, 1997). This prevention is achieved by access controls which restrict unauthorised access to the system itself, to physical devices, and to the data in the system transactions (Hollander et al., 1996). The access controls can be subdivided into system access controls, physical access controls, and data and application controls (Hollander et al., 1996). Firstly, system access controls are mostly used to prevent unauthorised access into the system through the use of the password and an access control matrix (Hollander et al., 1996). The password allows the user to have access to specific operations and the access control matrix identifies the functions that each user can perform when he/she has access to the system (Hickman, 1997). Secondly, physical access controls are used to prevent unauthorised access to the computer devices themselves (Hollander et al., 1996). These controls are implemented through restricted access to the computer room and visitors should sign a log noting the time they entered and left (Hickman, 1997). Finally, data and application controls are designed to maintain the integrity and privacy of data and processes within a computer system by preventing loss, destruction or access to data and applications by unauthorised personnel (Hollander et al., 1996). These controls can be achieved through the existence of a library and a librarian where the data is inaccessible to unauthorised people (Cosserat, 2000).

Generally speaking, the foundation of access security is password control which should be observed by auditors in order to ensure that they conform to the policy of the organisation (Hickman, 1997).

D) Other Controls: These controls include backup and recovery control which is related to the continuity of the computer activities, but may not affect the extent of the auditors' reliance on computer application control (Cosserat, 2000). It is important to back up files and systems periodically and store the backup media off-site in a secure location where they can be easily retrieved if needed. These backup and file recovery procedures, which are generally used with batch processing, are known as the grandparent-parent-child approach (Hollander et al., 1996; Woolf, 1997; Porter et al., 1996). According to this approach, if the child copy (the most recent copy) is destroyed, the data are reconstructed by rerunning the appropriate event data against the prior copy of the reference data (Hollander et al., 1996). In addition, if a problem occurs during that reconstruction run, there is one or more sets of backup data to reconstruct the parent which is then used to reconstruct the child. This ability to reconstruct data may not be achieved if the backup programs' integrity is not tested periodically to ensure that they can be loaded and used (Hickman, 1997).

3.3.4.2 Application Controls

Application controls are those controls over the input, processing and output of accounting applications (Hickman, 1997; Taylor and Glezen, 1994). The objectives of application controls are to improve the reliability of data processing by preventing and detecting fraud and correcting errors in individual transactions as they are processed within the system (Bell et al., 1999). Thus, these controls form a significant part of the control activities' component of the internal control systems and auditors must consider them separately for each accounting application. This consideration should provide auditors with reasonable assurance about the recording, processing and reporting of the

data by the IT-based accounting system (Cosserat, 2000). The following subsections focus on the types of application controls which are widely recognised:

A) Controls Over Input: The importance of these controls can be observed since none of the information processing can correct inaccurate or incomplete input data (Hollander et al., 1996). These controls are designed to ensure that information initially captured within the system is accurate, complete and properly authorised (Bell et al., 1999). The accuracy of the input data is checked by using several techniques. These techniques include firstly, authorisation which requests each transaction entry to be properly authorised and approved in accordance with the management's general or specific authorisation (Cosserat, 2000). Secondly, it includes the conversion of input data which also includes the transformation of information into an electronic form (Bell et al., 1998). Controls over this conversion are intended to ensure that the data are correctly entered and that transformed data are valid (Cosserat, 2000). Thirdly, completeness of input means that input data have not been lost, added, duplicated or changed during movement between processing steps or between departments. This competence of input data can be achieved by the use of many techniques such as sequence checks (Hickman, 1997). Finally, error correction includes ensuring the accuracy of accounting records through the correction of inaccurate data (Cosserat, 2000).

B) Control Over Processing: Processing controls within a computer system provide assurance that the correct data and program files are used, all data are processed in a secure manner, are accounted for and written to the appropriate file and the data conform to predetermined standards and fall within specified parameter values (Chartered Institute of Public Finance and Accountancy, 1987). In a wider sense,

processing controls provide assurance that transactions in the system are manipulated correctly and appropriately (Bell et al., 1999). These controls can be obtained by ensuring that computations, aggregations and postings are accurately performed (Bell et al., 1998). Processing controls take many forms. However, the most widely used techniques include, firstly, control totals which facilitate the balancing of input totals with processing totals for each run (Cosserat, 2000). Secondly, file controls embody devices to verify that the correct file is being updated and prevent the inadvertent destruction of files (Hollander et al., 1996). Some of these controls include external file labels which are physically attached to magnetic tape or disks so that a file can be identified visually, and internal file labels which are in machine-readable form and which are verified by computer before processing can be begin or be successfully completed (Hollander et al., 1996; Cosserat, 2000). Thirdly, processing tracing data aim to determine if the processing is correct (Taylor and Glezen, 1994; Hickman, 1997). These controls involve a print-out of specific data before and after the processing in order to evaluate the change in the data (Cosserat, 2000). Finally, sequence tests are implemented to ensure that records are processed in a specific order and there are no duplicated or missing data (Hickman, 1997; Cosserat, 2000; Taylor and Glezen, 1994).

C) Controls Over Output: Output controls are designed to ensure that the output from the system is appropriately reported for an effective and efficient response and also that the output is not made available to unauthorised personnel (Bell et al., 1999; Hollander et al., 1996). Some of these controls include firstly, a reconciliation of totals which embodies a comparison of output totals that are generated by the system with input and processing totals that are generated by the data control group and the user department in order to detect any differences (Taylor and Glezen, 1994; Cosserat, 2000). Secondly, it

includes a comparison to source documents which aims to compare output totals with source documents that were originally passed for processing (Hickman, 1997; Cosserat, 2000). Lastly, it involves visual scanning which includes reviewing the output to ensure that it appears complete and reasonable (Taylor and Glezen, 1994; Cosserat, 2000). Also, it may embody a comparison of actual results with estimated results (Cosserat, 2000).

3.3.4.3 The Effects of the Interrelationship between Application Controls and General Controls

The two broad categories of internal controls, namely, general control and application control, are both essential for effective internal controls in an IT-based accounting environment but they are not of equal importance (Porter et al., 1996). In other words, if the general control is insufficient, then it is likely that application controls will not be applied correctly, and the internal control system as a whole will be inadequate (Hall, 2001; Cosserat, 2000). However, if the general control is perfect, this does not mean that application controls may be dispensed with (Woolf, 1997).

The following subsection provides an overview of the audit approaches used by auditors to test the reliability of internal controls in an IT-based accounting environment.

3.3.5 Types of Audit Approaches Used to Test Internal Controls in an IT-based Accounting Environment

As mentioned above, the auditors must obtain sufficient understanding of the internal controls and of how to assess control risks in order to plan their audit. This understanding can be obtained through studying and evaluating the internal control systems. The methodology for the study and evaluation of internal controls in an IT-

based accounting environment is conceptually the same as for a manual accounting environment (Cosserat, 2000). Auditors in an IT-based accounting environment should evaluate and test general controls and application controls. However, in performing tests and substantive procedures in IT-based accounting systems, auditors may utilise computerised-assisted audit techniques (Williams, 1991).

In auditing IT-based accounting systems, reliance on application controls depends on the existence of adequate general controls. Therefore, general controls are normally tested first. The common tests used to verify general controls in an IT-based accounting environment include testing operating systems controls, testing data management controls, testing organisational structure controls, testing system development controls, testing systems maintenance controls, testing computer centre security, testing electronic data interchange controls, and testing personal computer controls (Hall, 2001). Broadly speaking, such tests do not require the use of the CAATs (Taylor and Glezen, 1994; Cosserat, 2000). However, this is not the case with application controls (except if the auditing around the computer approach was used). Application controls fall into two classes, namely *tests of application controls*, and *tests of the transaction details and account balances* (i.e. substantive tests) (Hall, 2001). The following subsections provide the audit techniques that are used by auditors to verify the effective functioning of application controls in the IT-based accounting system.

3.3.5.1 Auditing around the Computer: This is also known as "the audit without the computer". Under this approach the input and output are examined, but the detailed processing within the computer is ignored (Hall, 2001; Porter et al., 1996). In other words, the concept of auditing around the computer means that the auditor avoids the

computer. One advantage of such an approach is the low level of technical knowledge that is required to audit without the computer (Hollander et al., 1996). However, the disadvantages of such an approach are that the capabilities of the computer are not used and possible cost savings in audit time and effort are not realised (Cosserat, 2000). In addition, it does not allow auditors to detect programme errors that do not show up in the computer reports (Cosserat, 2000). Such an approach may have been acceptable in the past when the computer was simply functioning and where the reconciliation of input to output was relatively easy (Porter et al., 1996). However, this traditional notion of auditing around the computer does not seem to be realistic and acceptable as far as the present widespread use and sophistication of IT-based accounting systems are concerned (Rezaee et al., 2001; Hollander et al., 1996; Hall, 2001). In other words, auditors are expected to investigate the programs used to process the data besides the input and output.

3.3.5.2 Auditing through the Computer: According to this approach, not only the input and output are examined, but also the processing which goes on inside (Hall, 2001; Porter et al., 1996). The programs which are used to process the data are also examined. The basic theory behind this approach is perhaps similar to that of system based auditing; if the auditor can rely on the processing system, then the records have an increased probability of being accurate.

There are several reasons which drive auditors to take advantage of this approach when they are testing application controls in IT-based accounting systems. These reasons are: many internal controls are included in the system program; an absence of the visible transaction trail; the complexity of computer program; the need to test large volume of

records (Cosserat, 2000). However, the major problems with testing through the computer are that auditors are required to have special knowledge and skills in order to utilise computer facilities. In addition, it has been argued that automated programming techniques are relatively new to financial auditors and, if they are executed incorrectly, this will lead auditors to issue inappropriate audit conclusions (Hickman, 1997). Another problem with this approach is the possibility of the disruption of the entity's computer operations while the auditors are using the computer equipment, programs and files (Cosserat, 2000). Finally, auditing through the computer has been criticised because it places less emphasis on the testing of records and more on the examination of the processing system itself (Williams, 1991). The next subsections present techniques which are widely used to test the operation of specific programmed application controls.

A) Test Data: This technique is used to test the functioning of controls in IT-based accounting systems on a static basis; that is, when the client is not processing the program at the time it is tested (Taylor and Glezen, 1994). In the test data approach, the auditors prepare dummy transactions and process them through the client's software and, in turn, compare the output from processing the dummy data with the auditors' expected output to determine whether the controls are operating effectively (Cosserat, 2000). The greatest advantage of using this approach is that the auditors have a reasonable assurance that the client's programs they test are functioning as they prescribed (Taylor and Glezen, 1994). Also, this approach is inexpensive and simple. However, the use of this method has certain limitations. Some of these limitations include, firstly, a successful test data run does not necessarily prove the presence of reliable internal controls because other types of errors and irregularities could occur outside the program that is tested (Chambers and Court, 1991). Secondly, there is no

examination of actual data which are processed by the systems because this approach uses dummy data (Cosserat, 2000). Thirdly, since this approach was designed for batch systems, it may therefore not be feasible for online systems where there is no intermediate processing between the input devices and the central processing, and where more continuous processing takes place (Taylor and Glezen, 1994). Finally, in the data test approach, the auditors cannot be certain that the program which is furnished to them is the same programme used in the daily operations (Taylor and Glezen, 1994). In spite of the limitations mentioned above, the use of the test data approach provides auditors who audit IT-based accounting systems with information which cannot be obtained by ignoring the computer system.

B) Integrated Test Facility (ITF): Under this technique, auditors run the simulated data while actual client data are being processed with the client's IT-based accounting system instead of running simulated data on a static basis with the client's IT-based accounting system as in the test data approach (Taylor and Glezen, 1994). This technique requires the creation of a small subsystem within the regular IT-based accounting system by devising dummy master files or appending dummy master records to existing entity files (Cosserat, 2000). Then test data are introduced into the system together with actual data and the results from the accounting system are compared with those expected by the auditors. The most important benefits of using the integrated test facility are that it permits the auditor to process data under actual operating conditions and also the client's IT-based accounting system does not have to be dedicated entirely to testing simulated transactions (Taylor and Glezen, 1994). However, the major disadvantage of using this approach is the risk of potentially creating errors in the entity

accounting data if no proper modification has been made to cancel the dummy data (Cosserat, 2000).

C) Parallel Simulation: This technique contrasts the audit techniques illustrated above which require the auditor to input the test data to be processed by the client's IT-based accounting systems and where auditors must confine their testing to controls contained in the client's program (Taylor and Glezen, 1994). The parallel simulation method involves the actual data being processed by using audit software which is designed to reproduce or simulate the entity's processing of real data (Cosserat, 2000). Then the results from both the auditor's software and the client's system are compared. If the real system (i.e. client's systems) and the parallel yield the same output then the auditor would have confidence that the client's system is accurate (Hall, 2001). The use of parallel simulation has many advantages both for the auditors and the entity. Some of these advantages include firstly, that this technique allows conducting tests for error conditions that may not be detected by the client's IT-based accounting system (Taylor and Glezen, 1994). Secondly, this approach does not corrupt the entity's files and it may be performed by an independent computer facility (Cosserat, 2000). This, in turn, means the auditors can run their tests independently. Finally, this technique enables auditors to verify transactions by tracing them to their source documents and approvals since it is based on the real data (Cosserat, 2000). One disadvantage of using parallel simulation is the cost of writing a unique computer program for each audit (Taylor and Glezen, 1994). Another disadvantage of using this approach is that it is possible that the data selected for simulations are not representative of actual entity transactions (Cosserat, 2000). The last possible disadvantage of using the parallel simulation technique is that

the client's system may conduct operations that are beyond the capacity of the auditor's software.

D) Online Audit Monitor: In the real-time processing method[7] (also known as online entry/online processing), the traditional techniques, such as test data and parallel simulation, are not practical to test controls. The reason behind this is that the use of the test data technique may not be feasible in real time processing because batch entry is not used (Taylor and Glezen, 1994). In addition, parallel simulation may be used but the availability of generalised audit software to simulate a real time processing system is very limited (Cosserat, 2000). As a result, the online audit monitor technique has been devised to test controls in real time systems (Taylor and Glezen, 1994). Under this technique, an audit routine (a set of auditor's criteria) is built into the entity's processing programs to edit transactions and the output of the routine is used in testing the controls (Cosserat, 2000). More specifically, if any transaction meets the auditor's criteria, it will be flagged and printed (or written on disk or tape) for the review by the auditor (Taylor and Glezen, 1994). The advantage of the online audit monitor technique is the possibility of using this technique with the system which enters transactions via a terminal as they occur. Also, this technique can be applied without obstructing the client's normal processing routine (Taylor and Glezen, 1994). However, the major risk that is associated with this technique is the possible alteration by terminal operators of transactions which they know will be subjected to an auditor's edit process if the auditor's edit criteria are not kept confidential (Taylor and Glezen, 1994).

[7] This type of data processing was discussed above in Subsection 3.2.4.2.

3.3.5.3 Auditing with the Computer: Generally speaking, this approach involves utilising the computer as a tool of the audit (Hall, 2001). Within this approach, auditors use audit software packages to test the client's IT-based accounting system (Porter et al., 1996). In particular, they mainly use audit software packages to perform substantive tests (Hall, 2001). There are two main types of audit software, namely specialised audit software and generalised audit software. Specialised audit software is developed to perform audit tests in a particular entity. Despite this advantage, designing such software is extremely expensive and is usually beyond the expertise of the auditor (Porter et al., 1996). As a result, specialised audit software is rarely used by auditors. In contrast, generalised audit software packages are designed to perform a variety of audit functions in different clients' IT-based accounting environments. Generalised audit software was defined by Information Systems Audit and Control Association (ISACS) as "*A computer program or series of programs designed to perform certain automated functions. These functions include reading computer files, selecting data, manipulating data, sorting data, summarising data, performing calculations, selecting samples, and printing reports or letters in a format specified by the auditor*" (CAATs guideline, p.3, 1998). Using such packages has become more common, especially in recent years, since they are now available at a moderate cost (Cosserat, 2000). In addition, they have the ability to check a lot of transactions in a short time and this ability enables auditors to expand the size of their samples with little additional cost. However, the main drawback of such packages is that they may be inappropriate for some clients' IT-based accounting systems.

It is worthwhile mentioning at this point that the last two approaches (i.e. auditing through the computer and auditing with the computer) are complementary to each other.

Parallel simulation, for instance, is a technique in the auditing through the computer approach, which entails using audit software. This audit software is also a tool in the auditing with the computer approach. As a result of this association, the term "computer-assisted audit techniques" used to denote various audit techniques related to either or both of these two approaches. Computer-assisted audit techniques (CAATs) are defined by ISACA as "*Any automated audit techniques, such as generalised audit software, utility software, test data, application software tracing and mapping, and audit expert systems*" (CAATs guideline, p.3, 1998).

Based on what has been discussed so far, it seems that the introduction of IT-based accounting systems has an impact on the clients' environment and the audit profession alike. This leads the study to discuss how the professional bodies responded to the spread of technology. This issue will be considered next.

3.4 Auditing Standards Related to the IT-based Accounting Environment

It was pointed out above that the introduction of IT-based accounting systems changed the way by which accounting data are processed and maintained. Although the overall objective and scope of audit function did not change as a result of this introduction, the techniques and skills required for implementing auditing in such an environment changed (Hall, 2001; Taylor and Glezen, 1994; Cosserat, 2000; Turley and Cooper, 1991). This situation raised a question about the quality of assurance that can be provided by auditors for the various users of financial statements in this new environment. As a result, professional bodies responded to such a requirement through

issuing standards and guidelines applying specifically to auditing in an IT-based accounting environment. For instance, the Auditing Practices Committee in the UK issued the first guideline "*Auditing in a computer environment*" in 1984 and, in the same year, the Auditing Standards Board in the USA issued their first standard "*The Effects of Computer Processing on the Examination of Financial Statements*", whereas, in SA, the first standard was issued in 1997. However, it is beyond the scope of this study to cover all the audit standards and guidelines that are related to auditing in an IT-based accounting environment that were issued by different professional bodies around the world. In particular, and for the purpose of this study, the author will concentrate only on the Saudi audit standard related to auditing in such environment that was issued by SOCPA in 1997. Before going on to present an overview on the Saudi audit standard in an IT-based accounting environment, it would be helpful to offer a definition of what is meant by auditing standards. This will be the subject of the next subsection.

3.4.1 Definition of Auditing Standards

Auditing standards are defined by the Oxford Dictionary of Accounting (1995; p. 34) as follows: "*Audit standards contain basic principles and essential procedures with which auditors are required to comply with in the conduct of any audit of financial statements*". Generally speaking, the purpose of standards is to measure the quality of the audit. Measuring such quality is imperative to ensure that the profession meets its responsibilities to clients, to society, and to regulators who rely on external auditors to maintain the credibility of financial information (Cosserat, 2000). In short, auditing standards lend credibility to the work of the auditor. Thus, auditors, as in any other profession, are accountable in law for their professional performance. Accordingly, it is vital that the auditors comply with professional pronouncements in completing their

work in order to avoid facing a lawsuit for negligence and incur costs and damages for failure to comply with them. The discussion will now continue by providing an overview of the Saudi audit standard in an IT-based accounting environment.

3.4.2 The Saudi Audit Standard in an IT-based Accounting Environment

In response to the increased adoption of IT-based accounting systems by organisations in SA, SOCPA issued the first audit standard "*Audit Standard in Organisations that Use the Computer*" in 1997. This standard is the first audit standard issued by SOCPA since its emergence in 1992 as an institutional body responsible for developing accounting and auditing standards in SA. Shedding a brief light on the formulation of the Saudi standard in an IT-based accounting environment might have implications for the study.

3.4.2.1 Formulation of the Saudi Audit Standard in an IT-based Accounting Environment

Generally speaking, accounting and auditing standards in developing countries are adopted from developed countries and Saudi Arabia is no exception[8]. The process of setting auditing standards in developing countries is based on mimicking the developed countries' model. The development of the Saudi audit standard in an IT-based accounting environment that was issued by SOCPA in 1997 was examined by Aba-Alkhail (2001). He stated that the strategy used by SOCPA for setting this standard is based on a survey of the existing USA and UK auditing standards, and the International Auditing Standards in which the US standards were used as a yardstick. This situation

[8] For more details about setting accounting and auditing standards in SA see, for example, Al-Rumaihi (1997); and Aba-Alkhail (2001).

raises questions about the appropriateness of this standard to the IT-based accounting environment in SA and, in addition, the capability of audit firms in SA to comply with the requirements of this standard. Investigating these issues will be one of the main interests of this study. The next subsection is devoted to a review of the Saudi audit standard in an IT-based accounting environment.

3.4.2.2 Reviewing the Saudi Audit Standard in an IT-based Accounting Environment

The aim of "*Audit Standard in Organisations that Use the Computer*" issued by SOCPA in March 1997 is to identify the audit procedures that auditors have to perform when auditing any organisation using IT-based accounting systems. The key requirements of the Saudi audit standards in an IT-based accounting environment include understanding the client's activities and processing of accounting data, skills and competence, performing of analytical procedures, risk assessment, and an evaluation of internal control test. The following provides an explanation for each one:

A) Understanding the Client's Activities and the Processing of Accounting Data:

The key points included in this section of the standard can be summarised as follows:

- Auditors should take into account the methods used by an organisation for processing the accounting data, including whether the entity uses a third party to process its data, when planning an audit process since such methods affect the design of the accounting systems and the nature of internal control procedures.
- The extent of using the computer may affect the processing of important accounting applications, and the extent of difficulties associated with this processing may influence the nature, timing and extent of audit procedures. Accordingly, when

auditors evaluate the impact of using IT-based accounting systems by the organisation on the financial statements, they should take into consideration the following:

- Identifying the extent to which IT-based accounting systems are used.
- The extent of the difficulties connected with the operation of IT-based accounting systems.
- The importance of the computer in managing and controlling the activities.
- The structure of the organisational activities of processing data by using IT-based accounting systems.
- Visibility of data: the documents used to enter the data to the IT-based accounting systems and which are required by auditors may exist for a short period and may not exist at all because of entering the data directly into IT-based accounting systems.
- Using computer-assisted audit techniques (CAATs) to increase the efficiency of audit procedures since CAATs enable auditors to apply specific procedures to some accounts or all transactions. In addition, auditors, when auditing some IT-based accounting systems, may face difficulties in carrying out particular control tests without the help of CAATs. They may even find some procedures impossible.

*B) **Skills and Competence:*** This section of the standard requires auditors to obtain the necessary knowledge and skills which will enable them to study the impact of processing accounting data by computer on the audit procedures and which will allow them to understand the following of the transactions. Although the standard allows auditors recourse to the assistance of IT specialists, it specifies that the auditor has to have sufficient IT knowledge in order to be able to evaluate whether or not the work of

IT specialists is adequate. In addition, the standard emphasises that the auditor's responsibility is similar to the responsibility of the assistant IT specialists.

C) Performing Analytical Procedures: This section of the standard obliges auditors to obtain confirmations from analytical procedures based on tallying recorded amounts with those expected and which were gained from other sources. In addition, they must ensure that the data used in preparing such expectations is sufficiently reliable. Moreover, the auditor should evaluate the extent of his confidence in the data by taking into account the source of the data and the circumstances under which the data were collected. One of the factors which may affect an auditor's confidence in the data is existence of sufficient internal control systems.

D) Risk Assessment- Understanding the Control Environment: The key issues included in this section of the standard can be summarised as follows:

- Auditors have to gain sufficient knowledge about accounting systems when assessing risks in the introductory phases in order be able to understand the entire control environment.
- The control environment has inclusive impact on creating, increasing or decreasing the efficiency of specific policies and procedures. Accordingly, auditors should take into account managing the processing of data electronically when examining the organisation's structure, methods of authorisation and methods of management control.

E) Risk Assessment- Control Testing: The standard pointed out, in this section, that auditors should take into account the following issues when they decide to depend on

internal control in carrying out the audit process:

- Policies and procedures of the internal control structure should be identified which are suitable for identified conformations and which may prevent or discover material errors in such conformations.
- Control tests should be performed to evaluate the efficiency of these policies and procedures.
- In order to identify and implement control tests, auditors should take into consideration both manual and computerised control which affect IT-based accounting systems (i.e. general control), and also application control.
- It is preferable to test the design of general control prior to an examination of the application control.

F) Evaluation of Internal Control Test: This section of the standard focuses on the importance of general control in an IT-based accounting environment since it may have an impact on application control. In particular, if the general control is insufficient, there is a risk of the existence of undiscovered errors in the application control. As a result, the weakness in general control in an IT-based accounting environment may prevent testing the application control in such an environment. However, the manual procedures may provide an efficient control of application.

G) Effective Date: This standard is effective for auditing all financial statements which are prepared for the period immediately after the issue of the standard (i.e. 18 March, 1997).

3.5 Conclusion

This chapter focused on how IT-based accounting systems affect the audit function. The introduction of IT-based accounting systems has completely changed the way in which accounting data are entered, processed and controlled. Even though this did not affect the objectives and scope of the audit, it has affected the audit procedures and methods and also the skills required by the auditor. The traditional techniques which were used to test the reliability of accounting systems are not as appropriate in an IT-based accounting environment. In addition, auditors need adequate skills and knowledge of IT in order to be qualified to audit in such an environment.

It is inevitable that the advent of IT-based accounting systems has had an impact on the way in which auditors evaluate internal controls and perform compliance and substantive audit procedures. The traditional notion of auditing around the computer does not seem to be realistic or acceptable as far as the present widespread use and sophistication of IT-based accounting systems are concerned. Auditors are expected to investigate the programs used to process the accounting data by using computer-assisted audit techniques and not just examine the input and output from IT-based accounting systems. This requirement (i.e. using CAATs), in addition to having necessary knowledge and skills of IT, is one of the main requirements of the Saudi audit standard in an IT-based accounting environment that was issued by SOCPA in 1997.

If the internal controls in an IT-based accounting environment are properly designed, the auditors will get greater assurance than in a manual accounting environment. In addition, these internal controls will facilitate their task when they apply audit tests. However, if this is not the case, risks, such as abuse from inadequate internal control

systems, would be greater than in manual accounting systems and the security of IT-based accounting systems would be threatened. More detailed discussion about the various potential risks that are associated with auditing in an IT-based accounting environment will be provided in the next chapter.

CHAPTER FOUR

POTENTIAL RISKS IN AN IT-BASED ACCOUNTING ENVIRONMENT

4.1 Introduction

Chapter Three provided an insight into the impact of IT-based accounting systems on the audit function. The review revealed that many of the traditional notions and concepts of the manual accounting environment cannot be used in an IT-based accounting environment. In a wider sense, the emergence of IT-based accounting systems has changed the process of recording and storing business transactions (Rezaee et al., 2001). There is no doubt that the IT-based accounting systems provided opportunities for increased control and enhanced productivity (Bell et al., 1999). However, they created new risks, concerns and challenges for auditors who audit in an IT-based accounting environment (Helms and Mancino, 1998; Bell et al., 1999; Helms, 1999; Mills, 1995; Hannaford, 1995). Accordingly, the subject of the potential risks that are related to auditing in an IT-based accounting environment has received attention from a wide variety of institutes, academics and practitioners who are contributing to the increasing knowledge in this area.

The purpose of this chapter is to highlight the potential risks that may face auditors who audit such systems and which may have implications when studying the level of audit risk in an IT-based accounting environment.

This chapter is organised as follows. The next section explains the concept of audit risk.

The third section deals with components of audit risk while the fourth section examines the various risks associated with auditing in an IT-based accounting environment. Finally, Section Five includes the chapter's conclusion.

4.2 The Concept of Audit Risk

The word risk appears to be an important concept in modern commercial life and in turn it is not surprising that the term should now be an accepted part of the discourse in auditing (Turley, 1989). Auditors are required to give reasonable assurance that financial statements are free from misstatements (Lee, 1993). However, the problems round the detection of such misstatements result in audit risk. Audit risk is defined in SAS 300: Accounting and Internal Control Systems and Audit Risk Assessment (APB, 1998, para. 3) as the risk of the auditor giving "*an inappropriate audit opinion on financial statements*". This arises when the auditors give an unqualified (clean) opinion when the accounts are materially misstated (Cosserat, 2000). This risk takes three forms which are: firstly, planned risk in pre-audit when the engagement is assumed by auditors; secondly, ex-post risk which denotes risk which is unknown to auditors until they complete their work; and finally, estimated risks that are known to auditors during the audit through their assessment of the entity's circumstances (Lee, 1993). Some of the risks that auditors encounter can be detected and assessed by them through their work and the remainder will remain unknown to them despite their reviews and tests (Lee, 1993). However, auditors are expected to plan sufficient audit actions to maximise the detection of misstatements and, in turn, minimise audit risk. This can be achieved by performing additional audit procedures that will assist in reducing the actual risk level but will increase the cost of the audit (Cosserat, 2000). There is an inverse relationship between the audit risk level and the amount of necessary audit effort (Taylor and

Glezen, 1994). The balance between them is reflected in setting the overall planned audit risk that auditors are willing to accept when they attest to the fair presentation of financial statements. However, there are many factors that influence the assessment of the overall audit risk including the knowledge of the entity's business and management, the intended uses of financial information, the entity's legal and financial stability, and the control environment and operations (Cosserat, 2000; Gill et al., 2001). In addition, auditors are increasingly concerned about the implications of information technology for assessing risk and planning the engagement (Bell et al., 1998). The discussion of the components of audit risk is the subject of the next section.

4.3 Components of Audit Risk

Audit risk can be broken down into three components: inherent risk, control risk and detection risk (Lee, 1993). In the following subsections, these components of audit risk are discussed in detail:

4.3.1 Inherent Risk

Inherent risk is defined in SAS 300 (APB, 1998, para. 4) as "*The susceptibility of an account balance or class of transactions to material misstatements, either individually or when aggregated with misstatements in other balances or classes, irrespective of related controls*". The assessment of inherent risk is made primarily in the planning phase of the audit and it requires the consideration of matters that may have a pervasive effect on assertions for all or many accounts, and matters that may pertain only to assertions for specific accounts (Cosserat, 2000). Therefore, auditors are required to consider the factors that are likely to have an effect on the occurrence of errors or misstatements. These factors can be divided into two types, which are factors affecting

the likelihood of errors or misstatements occurring in the financial statements in general (termed entity level factors in SAS 300); and factors affecting the likelihood of errors or misstatements occurring in specific account balances or classes of transactions (Manson, 1997). The most important factors that may affect inherent risk at the entity level have been listed by SAS 300 (ABP, 1998, para. 15) as follows:

a) the integrity of directors and management;
b) management experience and knowledge and changes in management during the period;
c) unusual pressure on directors or management;
d) the nature of the entity's business;
e) factors affecting the industry in which the entity operates.

The first two factors are related to management integrity. In other words, there is a risk of misrepresenting of entity's financial statements in situations of pressure, such as when the entity has failed to meet profit forecasts, in order to portray the entity's state of affairs and profit or loss as desired by management (Porter et al., 1996). However, the last two factors are related to the nature of the client's business. In a wider sense, some businesses are less volatile than others. These may be vulnerable to changes in the state of the economy, competition, technological advancements, etc.

Similarly, the most important factors that may influence inherent risk at the account balance and class of transactions level have been listed by SAS 300 (APB, 1998, para. 15) as follows:

a) financial statement accounts which are likely to be susceptible to misstatement, for example, accounts involving a high degree of estimation;
b) the complexity of underlying transactions;

c) the degree of judgement involved during account balances;

d) the susceptibility of assets to loss or misappropriation;

e) the quality of the accounting systems;

f) the completion of unusual and complex transactions;

g) transactions not subject to ordinary processing.

The above factors direct the attention of auditors to the account balances and transactions where they are required to focus their audit efforts and tests. Also, they assist them in determining the nature and scope of their audit testing (Manson, 1997).

It is worth mentioning that auditors cannot change the actual level of inherent risk because it exists independently of the audit of financial statements (Cosserat, 2000). However, auditors should understand and assess inherent risk in order to determine the overall audit strategy.

4.3.2 Internal Control Risk

A basic definition of internal control risk is provided by SAS 300 (APB, 1998, para. 5) as follows: "*The risk that a misstatement that could occur in an account balance or class of transactions and that could be material, either individually or when aggregated with misstatements in other balances or classes, would not be prevented, or detected and corrected on a timely basis, by the accounting and internal control systems*". This risk is a function of the effectiveness of the entity's accounting and internal control systems, policies and procedures which are designed to ensure that all material misstatements will be prevented or detected (Cosserat, 2000). Thus, the auditor documents and assesses the internal control systems of the entity as a part of normal audit procedures in order to evaluate their reliability and in turn determine the level of

the control risk (Manson, 1997). Auditors, when they determine the level of the control risk, will be more concerned with the general control environment rather than the specific internal controls. Some of the factors that may affect the consideration of control risk include business planning and monitoring of performance, management attitudes and actions regarding financial reporting, the internal audit function, personal policies and procedures, and the effectiveness of the accounting system (Cosserat, 2000). The result of this initial assessment will determine whether the auditors can rely on the internal controls and the next step is to perform tests on those controls (Porter et al., 1996). However, if this is not the case, namely, the control risk is high because the internal controls are poor then all the necessary audit evidence will have to be obtained through conducting substantive procedures (Manson, 1997). The result of these tests will assist the auditor to decide if the initial assessment of control risk is appropriate or not. If the result of testing the internal controls is as expected, it will be considered as evidence for supporting the initial judgement of control risk. However, if the nature and the number of errors that are detected exceed expectations then the level of control risk may have to be reassessed.

Auditors can influence control risk, unlike inherent risk, by recommending improvements in internal controls but this influence is more likely to affect future periods; it is also subject to the extent that the entity's management implements the auditors' suggestions (Gill et al., 2001; Cosserat, 2000).

4.3.3 Detection Risk

Detection risk has been defined in SAS 300 (APB, 1998, para. 6) as follows: "*The risk auditors' substantive procedures (tests of detailed transactions and balances or*

analytical procedures) do not detect a misstatement that exists in an account balance or class of transactions that could be material, either individually or when aggregated with misstatements in other balances or classes". This risk is unlike inherent and control risk since the actual level of detection risk is dependent on the auditor's work in (Gill et al., 2001; Cosserat, 2000):

- appropriate planning, direction, supervision and review;
- the varying nature, timing and extent of audit procedures;
- effectively performing audit procedures and evaluating their results.

As noted above, the level of detection risk is controllable by the auditors, thus, they should take steps to reduce detection risk to the level it is economically feasible to do so (Porter et al., 1996). Finally, it has been stated by SAS 300 that the auditor should always perform some substantive procedures whatever the assessed level of inherent and control risk.

4.3.4 The Relationship Among Audit Risk Components

There is an inverse relationship between the assessed levels of inherent risks and control risks and the level of detection risk that the auditor can accept (Gill et al., 2001; Manson, 1997). For instance, if auditor assessment of inherent risk and control risk is low, the auditor can tolerate a higher level of detection risk, enabling a reduction in the extent of substantive procedures he or she must undertake (Lyon et al., 1996; Manson, 1997; Gill et al., 2001). The relationship between the audit risk components is expressed in the audit risk model as follows:

$$AR = IR \times CR \times DR$$

Where:

AR = audit risk

IR = inherent risk

CR = control risk

DR = detection risk

The audit risk model assumes that its components are independent of each other (Lyon et al., 1996). However, it has been found that there is an interrelationship between inherent and control risk since some factors, such as the management's integrity, affect both of them and this, in turn, leads to the suggestion that the effect of inherent and control risk may be more appropriately determined by making a combined assessment (Manson, 1997; Gill et al., 2001). In relation to audit risk components, it is worth mentioning that the auditor may express each component of audit risk in quantitative terms (e.g. percentages) or qualitative terms (e.g. low, medium and high) (Gill et al., 2001). The discussion will continue by examining potential risk associated with auditing IT-based accounting systems.

4.4 The Potential Risks that are Related to Auditing in an IT-based Accounting Environment

The aim of this section is to provide potential risks associated with auditing IT-based accounting systems. The major potential risks related to auditing in an IT-based accounting environment are explained below.

4.4.1 Inadequate Security

Broadly speaking, security refers to the policies and procedures for ensuring that access to IT-based accounting systems is restricted to authorised users (Helms and Mancino,

1998). Data security is concerned with protecting confidentiality, integrity and the availability of the IT assets of an organisation (Gorden, 1993). Accordingly, security in an IT-based accounting environment can be classified into physical security and logical security (Pathak, 2000). Logical security focuses on the traditional controls such as the passwords to control access to the data and programmes (Helms, 1999). However, physical security aims to restrict access to the equipment through, for example, secure parts of buildings (Helms and Mancino, 1998).

The Institute of Internal Auditors (1992) in Systems Auditability and Control (SAC) described "unauthorised access or changes to data and systems" as one of the three critical risks related to IT-based accounting systems. It has been argued by some writers (e.g. Furnell and Warren, 1997; Mills, 1995; Hannaford, 1995) that most computer crime (or abuse[1]) is not particularly sophisticated or complex but relies on a lack of basic security procedures. According to the UK Audit Commission's report on computer abuse (*Opportunity makes a thief – an analysis of computer abuse*) published in 1994, approximately one third of organisations did not have an IT security policy (Mills, 1995). Furthermore, the responses of organisations that claim to have an IT security policy to specific questions on security policy suggest that many such policies are either ineffective or not implemented (Mills, 1995). This was supported by a survey "Information Security Breaches Survey 2002 (ISBS 2002)" conducted by PricewaterhouseCoopers & DTI revealed that only 27% of UK businesses have a documented security policy. The absence of or ineffective IT security policies foster computer crimes (Hannaford, 1995). This is because IT-based accounting systems are

[1] It is worth mentioning that no such distinction will be made in the ensuing discussion. The two phrases are treated as synonymous.

more easily manipulated fraudulently than manual accounting systems especially in advanced systems where the audit trails are more difficult to follow (Comer, 1998). Thus, it has been concluded that computer crimes are a growth industry and it is anticipated that such crimes will become much more prevalent over the ensuing years as a result of the trend towards a paperless society (Mills, 1995; Hannaford, 1995). This view has been supported by the Institute of Internal Auditors in the UK, when reporting that computer abuse, which includes fraud, theft, hacking and unauthorised disclosure of personal data, has increased substantially over the past five years (Christy, 1995). This is in line with the findings of the UK Audit Commission's report on computer abuse in 1994. 1,073 responses from a variety of sectors revealed that 36 percent of these reported some kind of abuse incident (Furnell and Warren, 1997).

Computer crime has been defined as: "*conduct which involves the manipulation of a computer, by whatever method, in order dishonestly to obtain money, property or some other advantage of value, or cause loss*" (Spaul, 1991, p.418). However, a general definition of computer abuse has been provided by the Australian Computer Abuse Research Bureau (ACARB) in 1992 as follows (cited by Hinde, 1995, p.208): *Computer abuse is theft, fraud, embezzlement or damage related to computers and includes:*

a) *unauthorised manipulation of computer inputs and/or outputs*
b) *unauthorised access to the system through terminals or microcomputers*
c) *unauthorised modification or use of application programs, operating systems or computing equipment*
d) *trespass on data processing installations, theft of equipment, files or output*
e) *sabotage of computer installation equipment, files, application programs or operating systems*

f) unauthorised data interception.

Computer abuse takes many different forms such as fraud, virus, hacking, sabotage, illicit software and invasion of privacy. However, this study will concentrate on only the first three forms of computer abuse as follows[2].

A) IT-Related Fraud: IT-related fraud was defined in the Audit Commission's Survey in 1990 (cited by Hinde, 1995, p.218) as:

- *the unauthorised alteration of input*
- *the destruction or suppression or misappropriation of output from a computer process (whether paper or screen-based)*
- *the alteration of computerised data*
- *the alteration or misuse of programs, but excluding virus infections.*

It has been found that computer fraud is the most prevalent form of computer abuse according to a study which was conducted by the Caulfield Institute of Technology in Australia which revealed that various forms of computer fraud made up 60 of the 123 incidents of computer abuse (Wasik, 1991). In another study, which was conducted by the Institute of Internal Auditors in the UK, it was found that most IT-related frauds were committed by staff in a position to enter fraudulent data into computer systems or to amend existing data without authorisation (Christy, 1995). Naturally, financial systems are the most at risk according to the Audit Commission's report on computer abuse in 1994 which revealed that over one quarter, out of the 108 reported computer frauds, were related to systems which manage the payment of claims or allowances

[2] It is beyond the scope of this study to review all forms of computer abuse. For more details see, for example, Hinde, 1995.

while a further quarter of frauds were related to sales/debtor systems (Mills, 1995). IT-related frauds may be perpetrated in many different ways including firstly, input fraud which can be committed by tampering with data before or during their introduction into the computer (Wasik, 1991). Secondly, program fraud can be perpetrated by altering computer codes or operational programs on the computer and a typical example is the "round down fraud" where the computer rounds down any fractions of a penny on interest payments and diverts these to the fraudster's account (Wasik, 1991). This example has occurred in real practice when a fraudster opened an account in the name of Zwana and programmed the computer to transfer small fractions from all other accounts to the last named file on the computer list (Wasik, 1991). Lastly, output fraud can be perpetrated by suppressing or altering the computer output in order to commit or cover up fraud (Wasik, 1991).

Clearly, fraud has become much more prevalent as the trend towards a cashless society, where massive sums of money are being transferred electronically rather than by tangible assets such as cash or cheques, has increased (Mills, 1995; Wasik, 1991; Higson, 2002b).

B) IT-Related Viruses: The definition of IT-related viruses was provided by the Data & Computer Security Dictionary of Standard Concepts and Terms (cited by Hinde, 1995, p.224) as:

a) *In computer security, a variation of the Trojan Horse. It is propagating (attaching itself to files, programs) with a triggering mechanism (event, time) with a mission (delete files, send data).*

b) *In computer security, a form of malicious code which infects other programs by modifying them to include some version of itself.*

Viruses pose an increasing threat. The findings of the Audit Commission's report on computer abuse published in 1994 revealed that there was a tremendous increase in the number of reported virus infections (Mills, 1995). In ISBS 2002, roughly 41% of UK businesses suffered from virus infection or disruptive software compared with only 16% in ISBS 2000. These figures are similar to the levels experienced in US companies where 35% of respondents had quantifiable losses as a result of virus infection, according to a survey "Computer Crime and Security Survey" was carried out by Computer Security Institute / Federal Bureau of Investigation (CSI/FBI) in 2001. Computer viruses are introduced mainly from an infected external source through the use of computer networks which help computer viruses to spread very quickly around the world. This means that a virus can be used to affect data and programs and cause material errors in financial statements or server interruption of a business activity (Hickman, 1997). Therefore, computer viruses might be used to cover up any misstatements by management or employees. This risk may occur as a result of setting up an insufficient protection policy against virus attack through poor security precautions against unauthorised access and, in particular, using unknown or suspect software, and also by not installing anti-virus software and running it periodically (Wasik, 1991).

C) IT-Related Hacking: This was defined by the Audit Commission (cited by Mills, 1995, p.3) as "*Deliberately gaining unauthorised access to a computer system usually through the use of telecommunication facilities*". The issue of computer hackers can be considered to represent longer-term threats to the information society (Furnell and

Warren, 1999). Although, hackers are by no means a new threat, it seems that hardly a week goes by without some dramatic case of hacking being reported (Mills, 1995; Furnell and Warren, 1999). This is supported by the findings of the UK Audit Commission's report on computer abuse (*Ghost in the machine – an analysis of IT fraud and abuse*), published in 1998, which revealed that there is a significant increase in the number of hacking incidents compared with those mentioned in the 1994 report. Over the four-year period between the two surveys, the number of reported cases of hacking has shown an 8 per cent increase (Furnell and Warren, 1999). ISBS 2002 showed that hacking activity in the UK has tripled since 2000. The incident rate for hacking activity in the USA appears to be much more than in the UK. According to the CSI/FBI survey in 2001, 40% of respondents detected system penetration through their Internet gateway and 36% detected denial of service attacks on their web-site(s). It is expected that the new industries of the millennium, such as electronic commerce, will be the most common victims of this new style of problem (Furnell and Warren, 1999).

In the light of the above, it can be argued that security of information in an IT-based accounting environment is one of main sources of risk that face both management and auditors. This risk is supported by the widespread use of the Internet which breaks down physical barriers and also facilitates external malicious activities.

4.4.2 Data Integrity

One of the major concerns associated with IT-based accounting systems is the possibility that the data may become invalid (Pathak, 2000). This issue "data accuracy and integrity" was mentioned in the SAC report as one of the risks most associated with IT-based accounting systems. Bell et al. (1998) argue that the implementation of information technology does not automatically ensure that records and transactions will

be processed more accurately. This issue was examined by Bell et al. in 1998 and 1999 respectively. Their research revealed that the audit differences (including accounting errors and fraud) are more frequent when accounting systems were computerised. The overall results of their research indicated that the most important causes of IT-related audit differences were problems with data entry, internally-developed software (mainframe), microcomputer applications (including end-user computing applications), improper computer processing, improper/incorrect program coding, problems with IT personnel, incorrect application of internal controls, and inadequate internal controls. In addition, poor segregation of duties and management override of controls were the main motivations for fraud in an IT-based accounting environment. Thus, they argue that the advantages of IT do not automatically ensure that records and transactions will be processed more accurately and the effective implementation of IT requires skilled personnel. Since most of the issues mentioned above, and which affect the integrity of data in an IT-based accounting environment, were discussed in the previous chapter, the next subsections will focus only on the two new potential risks, namely the lack of competence of a client's personnel in IT and the unreliability of accounting software.

A) Lack of Competence of Client's Personnel in IT: Accounting concepts have not changed as a result of the introduction of IT-based accounting systems. However, the environment in which accounting is practised has changed (Wildey, 1991). Accordingly, effective implementation of IT-based accounting systems require competent staff (Bell et al., 1998; Wood, 2002). Furthermore, Bell et al. (1998) argue that IT-based accounting systems require a higher degree of competence to implement and operate than manual accounting systems. In particular, the findings of their study (1999) revealed that incompetent IT personnel is one of the reasons behind problems in

clients' IT-based accounting systems especially complex ones. This finding is in line with the SAC report which identified "lack of available skilled human resources" as one of the risks related to IT-based accounting systems. Broadly speaking, there is a shortage of IT skills and obtaining such skills constitutes a real concern for organisations (Heckman, 1998). In an IT-based accounting environment, this problem could be attributed, in part, to the growing gap between accounting practice and accounting education (Wildey, 1991). In other words, accounting education may not reflect the concurrent accounting practice. As a result, both knowledge and experience are largely acquired on the job (Wildey, 1991). Despite this, there are options available for acquiring IT skills that are needed by organisations such as training existing staff and recruiting new staff (Heckman, 1998). However, there are certain drawbacks such as doubt about their effectiveness (particularly the training of existing personnel) which might discourage management from going ahead with these options (Heckman, 1998).

B) Unreliability of Accounting Software: One of the main concerns regarding the integrity of data in an IT-based accounting environment is whether accounting software performs its functions consistently, accurately and predictably (Muggridge and Trott, 1994; Silltow, 2003b; Blewett and Jarvis, 1989; Comrie, 2000). This concern comes from two sources. Firstly, there is the possibility that the software has bugs, especially the very cheap software (Blewett and Jarvis, 1989). Blewett and Jarvis (1989, p.132) stated that "*We have knowledge of one medium-sized practice which wrote its own program and the development time was estimated to be six months, involving one partner's time and a number of senior staff- and the program after this still had a number of bugs*". This issue was reported in the United State's federal government report which revealed that $180 billion worth of software was sold in the United States

in 2000, but bugs in software cost the country about $60 billion (Silltow, 2003a). The other source of such concern is upgrading existing software (Bell et al., 1998 and 1999; Silltow, 2003a; Comrie, 2000). There are a host of reasons why software may be upgraded, including, among others, harnessing new technology, fixing bugs, and fulfilling the needs of an organisation. Typically, the upgrade would include modifying critical components to accommodate new features and bug fixes (Silltow, 2003a; Comrie, 2000). Such modification might make it impossible to reproduce the release in its original form (Comrie, 2000). In addition, it can result in loss of data, inaccurate reporting or fraud (Silltow, 2003a; Bell et al., 1998). If not enough attention was given to ensure the security and efficiency of the upgrade, it could be argued that a software upgrade could be pose real risks for organisations and auditors alike.

4.4.3 Visibility of Audit Trail

The definition and importance of the audit trail was discussed in the previous chapter[3]. Broadly speaking, the ability to trace the audit trail in an IT-based accounting environment is threatened by developing inappropriate accounting software and also the shift to electronic commerce (Williams et al., 1997; Bierstaker et al., 2001). These two issues are explained as follows. Firstly, good accounting software should be able to provide an audit trail (Muggridge and Trott, 1994). Such an audit trail is a key element in ensuring the reliability of transactions in IT-based accounting systems (Jones, 2000). However, an inspection carried out on a range of accounting software including, among others, the respective audit trails revealed some shortcomings (Gill et al., 2001). It is worthwhile mentioning that some concerns about the audit trail still exist in spite of the recent improvement in accounting software to rectify such shortcomings (Gill et al.,

[3] For more details, please see Section 3.3.3.2.

2001). Secondly, the audit trail was threatened by the increased trend to adopt electronic commerce (Williams et al., 1997). The term electronic commerce includes all commercial activities performed through electronic and computer-driven sources such as IT networks, automated teller machines (ATMs), electronic data interchange (EDI), and business conducted on the Internet (Pathak, 2000; Helms, 1999). The use of electronic commerce changes the way by which business transactions are processed and, accordingly, the accounting environment. In a wider sense, most accounting transactions within electronic commerce exist in electronic form without any paper documentation (Rezaee and Reinstein, 1998). For instance, an entity and its customers or suppliers use communication links to transact business electronically. A major concern for traditional auditors facing electronic commerce is the apparent erosion of controls through the lack of visible evidence. In particular, as electronic commerce allows information to transcend organisational boundaries (even national boundaries through international trading), business functions in two organisations may overlap so that an audit trail may become ambiguous or even lost (Williams et al., 1997; Pathak, 2000). This challenge was emphasised by Bierstaker et al., (2001) who stated that technologies such as EDI, image processing and electronic file transfer (EFT) will make traditional audit trails disappear.

4.4.4 Possible Reduction in Internal Controls

The impact of the introduction of IT-based accounting systems on the internal controls was reported in the previous chapter. This introduction has created opportunities for increased controls and, at the same time has exposed new risks that may threaten the internal controls in an IT-based accounting environment (Hollander et al., 1996; Gwilliam, 1987; Hickman, 1997; Bell et al., 1999). For instance, Gwilliam (1987) stated

that systematic features of computer operations is one reason why errors and fraudulent activities within IT-based accounting systems are greater on average than those found in manual accounting systems. The greatest risks that may threaten the internal controls in such an environment include, among others, the lack of segregation between duties, the possibility to access and alter data through computer facilities on different sites without leaving visible evidence, and the fact that some transactions are automatically executed and recorded without explicit management authorisation (Bhasker and Williams, 1986; Hollander et al., 1996; Cosserat, 2000; Gray and Manson, 2000). This has been heightened by the advent of electronic commerce which facilitated unauthorised access by strangers and the disappearance of the audit trail as mentioned above. Accordingly, if no adequate internal control systems are implemented in an IT-based accounting environment, committing fraud, errors, collusion and unauthorised transactions etc. may be easier than in a manual accounting environment. This view was supported by the report of the Institute of Internal Auditors in the UK which revealed that only 48 percent of the fraud cases were detected through internal controls, while the discovery was by accident 39 percent of the time (Christy, 1995). Further, the results of the study of Bell et al. (1998) revealed that fraud and errors are more frequent when systems are computerised. In addition, the authors identified incorrect application of internal controls and inadequate internal controls to be the main sources of these risks.

4.4.5 Lack of Skilled Auditors

One of the main concerns in an IT-based auditing environment is the lack of competent auditors who are able to deal and understand the nature of IT-based accounting systems (Bell et al., 1998; Gwilliam, 1987; Helms, 1999; Pound, 1978; Nottingham, 1976; Raval, 2000). This lack of competence was reflected in three ways: firstly, the historical

reliance of audit firms on particular experts in assessing the reliability of IT-based accounting systems (Bell et al., 1998). The natural result of this philosophy was that many auditors felt that they lacked the expertise necessary to evaluate and test IT-based accounting systems. Therefore, they would plan their engagements so as to audit "around" the computer as often as possible (Bell et al., 1998). Secondly, major computer abuse is often discovered accidentally and not by the auditors (Christy, 1995; Pound, 1978; Nottingham, 1976). Thus, Nottingham (1976) claimed that the auditor's failure in such an environment was the main cause for the growing number of computer security consultants in the USA. Lastly, many auditors have failed to recognise the beneficial capabilities of IT-based accounting systems (e.g. performing editing and field checks, and comparing and reconciling data across systems and sources) and do not adequately factor the existence of such controls into their assessment of such systems (Bell et al., 1999).

The literature has revealed that poor education and training are expected to be the main reasons behind the lack of skilled auditors in an IT-based auditing environment (Skudrna, 1982; Gwilliam, 1987; Helms, 1999; Raval, 2000). The level of education and training in IT did not match with the rate of change in technology. In particular, Gwilliam (1987) stated that the pattern of education and training of the great majority of auditors and the requirements for IT knowledge within the framework of professional examinations are both general and theoretical in nature are the reasons behind the lack of skilled auditors in an IT-based auditing environment. Accordingly, Helms (1999) and also Raval (2000) recommended auditors to increase their IT skills in order to be able to audit sufficiently in such an environment.

4.5 Conclusion

This chapter has reviewed the potential risks that are associated with auditing in an IT-based accounting environment. The review has pointed out that the introduction of IT-based accounting systems has exposed auditors to significant new risks. The major potential risks include inadequate security, the lack of competence of the client's personnel in IT, unreliable accounting software, the lack of a visible audit trail, a possible reduction in internal controls, and the lack of skilled auditors in IT.

Although previous studies mentioned the potential risks which are associated with auditing in an IT-based accounting environment, they have not explained the impact of these risks on the audit risk. In other words, it is not known whether the introduction of IT-based accounting systems contributed to increasing or decreasing the level of audit risk. In a wider sense, it is noticeable that there is a significant gap in the existing literature regarding the level of audit risk in an IT-based accounting environment. Consequently, there is a need to investigate empirically the impact of the introduction of IT-based accounting systems on audit risk. This issue will be discussed in subsequent chapters with a specific emphasis on Saudi Arabia. However, due to the short time span since the adoption IT-based accounting systems by organisations in SA and the lack of literature that discusses auditing such systems within a Saudi context[4], the author felt that carrying out a preliminary study might enhance the subject being explored in this study. Before proceeding to report the findings of the preliminary study, it is worthwhile presenting the research methodology that was adopted in this thesis. This topic will be the subject of the next chapter.

[4] The reviewed literature related to this subject has been written by Western writers in the context of developed countries.

CHAPTER FIVE

RESEARCH METHODOLOGY

5.1 Introduction

The previous four chapters have furnished a general background to the research theme of this study. The aim of this chapter is to present the research methodology that will be adopted in conducting the present study. Research methodology[1] is the programme that guides the investigator in the various stages of the research (Fink, 1995; Creswell, 1994; and Robson, 1996). It is the overall strategic choice made with the purpose of coming up with an approach that allows for solving the research problem in the best possible way within the given constraints (Ghauri et al., 1995). This implies that the selection of the research methodology depends mainly on, among others, research objectives and constraints considered by the researcher.

The subject of this chapter will be presented in nine sections. Following this introduction, the second section deals with choosing an approach for embodying a theory within the research process. Section three focuses on the selection of a strategy for this study, and the fourth section discusses the design of this selected strategy (i.e. the survey). Section five highlights the data collection methods which are considered suitable for this research. The design of these selected data collection methods (i.e. interviews and questionnaires) will be the purpose of sections six and seven respectively. The eighth section provides a general description regarding data analysis. The last section presents the chapter's conclusion.

[1] Generally speaking, there is no general agreement among writers on what is meant by research methodology. In other words, the phrase "research methodology" is used to reflect different notions such as "research design" or "research approach".

5.2 Choosing an Approach for Embodying a Theory within the Research Process

Broadly speaking, there are two approaches regarding how a researcher could incorporate theory within the research process. These were identified by the research methods texts such as Franfront-Nachmias and Nachmias, 1992; Ghauri et al., 1995; Gilbert, 1993. These approaches are theory before research (theory testing) and research before theory (theory construction). However, it is worth providing a brief definition for the term "theory" and also shedding light on the importance of incorporating a theory within the process of research before proceeding to discuss these two approaches.

5.2.1 The Definition of Theory

A theory is defined by Kerlinger (1979, p. 64) as "*A set of interrelated constructs (variables), definitions, and propositions that presents a systematic view of phenomena by specifying relations among variables, with the purpose of explaining natural phenomena*". Another definition of theory is given by Zaltman et al. (1982, as cited in Ghauri et al., 1995, p.19) as "*A set of interrelated concepts, definitions and propositions that presents a systematic view of specifying relations among variables with the purpose of explaining and predicting phenomena*". The importance of embodying a theory within the process of social research is highlighted in the following subsection.

5.2.2 The Relationship between Research and Theory

A researcher would be able to observe his/her research subject from different angles by having an idea about different theories since each theory has its own attributes (e.g. structure, setting). This is reflected in the words of O'Brien (1993, p. 11) when he stated

that "*Different theories bring different aspects of the world into view*". He also added "*The role of theory is precisely to make things that were hidden visible, to define some pattern and give some meaning to the sort of observations that the social researchers continually make when investigating society ... Seeing the world in different ways is the essential and fundamental role of social research and the ability to see these differences and to make sense of the different points of view that a researcher can take is the basic contribution that theory makes to the research process*". In short, the above quotation indicates that theories are treated as the privileged source of our understanding of empirical reality. In other words, a researcher would embody a theory within the process of research in order to understand how he/she can intellectually deal with his/her subject. The importance of making a connection between theory and research has been emphasised by many writers such as Bulmer (1986) and May (1993). In this respect, O'Brien (1993, p. 11) stated that "*It is important to make this connection between theory and research because all research is theory dependent. Whether the theory is acknowledged or not, pure empirical research is impossible*". The discussion will now proceed by providing a brief explanation for the two approaches for incorporating a theory within the research process.

5.2.3 The Two Approaches for Incorporating a Theory within the Research Process

As reported above, there are two approaches for embodying a theory within the research process in the social sciences. These two approaches are discussed below.

5.2.3.1 Theory before Research Approach

This approach assumes that there is a well-defined theory/model which could be utilised

to explain the phenomena under investigation (Franfront-Nachmias and Nachmias, 1992; Creswell, 1994; Gilbert, 1993). This strategy involves adopting a deductive approach to research where the researcher normally develops hypotheses or questions from the theory he/she is using for his/her research (Franfront-Nachmias and Nachmias, 1992; Creswell, 1994). These hypotheses or questions, in turn, will be subject to empirical testing in order to verify them. Based on the result of this testing, the adopted theory will be modified or accepted.

5.2.3.2 Research before Theory Approach

This strategy does not begin with a theory to test or verify. Instead, it involves adopting an inductive approach for theory construction (Franfront-Nachmias and Nachmias, 1992; Creswell, 1994; Gilbert, 1993; Ghauri et al., 1995). This process might start from general observations, facts, or empirical findings related to a particular subject. According to this approach, the researcher attempts to identify a systematic pattern for the purpose of constructing a particular theory/model suitable for his/her research (Franfront-Nachmias and Nachmias, 1992; Gilbert, 1993; and Ghauri et al., 1995). An important technique in carrying this out is grounded theory (Remenyi et al., 1998). The concept of grounded theory was developed by Glaser and Strauss (1967) and they define it as "*An inductive, theory discovery methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or evidence*". This theory is concerned with the concept of "discovery of theory from data", whereby the researcher uses the empirical research to establish directly the variables and concepts and the relationships which will be combined in the theory (Arksey and Knight, 1999; Remenyi et al., 1998; Martin and Turner, 1986). Thus, theories that have been inductively developed are

likely to be more appropriate (Glaser and Strauss, 1967). Grounded theory has been criticised for its focus on the generation of theories rather than their testing or verification (Silvereman, 2000; Denscombe, 2002). However, in areas which have received little study, it is important to generate theories and therefore this approach seems applicable.

In light of the above discussion, the author decided to apply the research before theory approach. In particular, the grounded theory approach was used to establish a theoretical framework within which to conduct the research. This is because the literature review revealed little previous work in this area and also that there were no well established theories in this field to take as a starting point. As Remenyi et al. (1998, p. 142) stated "*If the literature review does not reveal a strong and generally accepted theoretical framework, as is frequently the case in business and management research, then a grounded theory approach is required*". The next section deals with the selection of a strategy for this research.

5.3 Selection of Research Strategy

Establishing an overall strategy for a research project is an important step in any scientific enquiry. The research strategy refers to the general broad orientation or style taken in addressing the research problem (Robson, 1996). A research strategy provides the overall direction of the research including the process by which the research is conducted (Remenyi et al., 1998). There are different types of research strategies available to the business and management researcher. It is worthwhile shedding light on

some[2] of these strategies before proceeding to take a decision on which strategy is more suitable for this research. These are as follows:

- **Field Experiments:** A field experiment is "*a research study in a natural situation in which one or more independent variables are manipulated by the investigator under as carefully controlled conditions as the situation permits*" (Franfort-Nachmias and Nichias, 1992, p.211). The major advantage of this approach is that it enables the researcher to isolate and control a small number of variables which can then be investigated intensively (Robson, 1996; Franfort-Nachmias and Nichias, 1992; Galliers, 1992). However, there are definite limits to this type of research approach. These limitations include the difficulty of finding an organisation prepared to be experimented on (Remenyi et al, 1998). Moreover, replication is problematic. In other words, a researcher may have to wait for an auspicious occasion to arise to make such studies possible (Remenyi et al., 1998). Thus, this approach was deemed inappropriate since the research aims to look at "real-life" perceptions and find out opinions.

It is worth, before moving on to the next approach, mentioning that the researcher also decided to reject "*Laboratory Experiments*" since this type of research strategy was also considered to be inappropriate for the reasons mentioned above.

- **Case Studies:** The case study was defined by Yin (cited by Remenyi et al., 1998, p. 50) as "*an empirical inquiry that investigates a contemporary phenomenon within its real life context, when the boundaries between phenomenon and the context*

[2] It is beyond the scope of this research to review all the various research strategies. For more details on this topic see, for example, Remenyi et al. (1998) and Galliers (1992).

are not clearly evident, and in which multiple sources of evidence are used. It is particularly valuable in answering who, why and how questions in management research". The strength of this approach is that it enables the capture of "reality" in more detail. However, the following aspects of case studies are a common source of difficulty for researchers. Firstly, there is the difficulty of drawing boundaries around the subject matter of the case (Ryan et al., 1992). Thus, case study researchers have to place some limits on the subject matter. The second difficulty is the nature of the social reality which is being researched (Ryan et al., 1992). In a wider sense, social systems cannot be understood independently of human beings and the researcher cannot be regarded as a neutral, independent observer. There can be no such thing as an "objective" case study. This emphasises the problem of researcher bias. Finally, many accounting case studies require access to organisations and to confidential information (Ryan et al., 1992). This raises particular problems such as access to this information and also writing the case report. Thus, this approach was deemed inappropriate since there are difficulties in gaining access to organisations and also problems associated with making generalisations from individual case studies.

- **Action Research:** Action research was defined by French and Bell (cited by Remenyi et al., 1998, p. 49) as "*The process of systematically collecting research data about an ongoing system relative to some objective, goal or need of that system; feeding these data back into the system; taking action by altering selected variables within the system based both on the data and on hypotheses; and evaluating the results of the actions by collecting more data*". This type of research method might be seen as a subset of the case study and field experiment approaches. The major advantage of this approach is that it provides the researcher with good quality access (Remenyi et al.,

1998). In addition, the researcher's biases are made overt in undertaking the research (Galliers, 1992). However, its limitations are similar to those already described for the case study approach. Therefore, this approach was deemed inappropriate.

- **Simulation:** simulation is a "*method used to solve problems which are difficult or impossible to solve analytically by copying the behaviour of the system by generating appropriate random variables*" (Galliers, 1992; p. 156). Such an approach is useful when there is a requirement for the evaluation of formal mathematical relationships under a large variety of assumptions (Remenyi et al., 1998). In a wider sense, it is utilised when mathematical modelling is a key part of the study (Remenyi et al., 1998). However, its disadvantages are similar to those already identified for the field experiment. Thus, this approach was deemed inappropriate since the research aims to look at "real-life" perceptions and find out opinions.

- **Survey:** survey research commonly involves the collection of standardised evidence from a specific population, or some sample from one, usually but not necessarily by means of questionnaire or interview (Robson, 1996). Survey data can be used for one or more of the following purposes: to describe the phenomenon under scrutiny, to explore aspects of a situation, or to seek explanation and provide data for testing hypotheses (Remenyi et al., 1998; Franfort-Nachmias and Nichias, 1992). Surveys are a common strategy for research in business and management since such a strategy enables obtaining information that cannot be easily observed or that is not already available in a written or computerised form (Remenyi et al., 1998). In addition, the nature of the evidence which may be collected by such a strategy is regarded as detailed and deep, especially if it is obtained through a series of interviews (Remenyi et

al., 1998). Moreover, survey strategy, based very often on the mail questionnaire method, offers an opportunity to collect large quantities of data in a quick and economic manner (Remenyi et al., 1998). However, the time and effort spent in designing and piloting the questionnaire, and the low response rate are the major obstacles of such a strategy (Saunders et al., 1997).

After reviewing the various types of research strategies discussed above, the survey was considered to be the most appropriate research strategy to achieve the objectives of this study. In particular, and in terms of the exploratory nature of the study, the selection of such a strategy was an attempt to develop the grounded theory that was utilised in the initiation of this study since the survey strategy includes qualitative and quantitative research methods. The following section will provide an overview of the survey design.

5.4 Survey Design

The previous section revealed that the survey would be utilised as a research strategy for this research. This section seeks to highlight the procedures that were adopted for designing the survey. The research design of a study is the programme that leads the researcher in the different stages of the research (Fink, 1995; Creswell, 1994; Robson, 1996). It involves a number of aspects, such as the type of investigation, the purpose of the study, the extent of the researcher's interference with the study, the unit of analysis, the duration of the study, the sampling design, the data collection methods, the measurements and data analysis (Franfort-Nachmias and Nichias, 1992; Sekaran, 1992; Robson 1996). The following will look at some of these aspects in more detail[3].

[3] The rest of these aspects are covered in the coming sections.

- **The Purpose of the Study:** the purpose of the investigation is one of the most basic aspects of research design (Sekaran, 1992; Robson 1996). The basis of the purpose for the study can be exploratory in nature, descriptive or explanatory (or causal), depending on the stages of advancement of knowledge in the research area (Churchill, 1995; Fink, 1995; Sekaran, 1992). The following will illustrate the differences between these types. Firstly, exploratory research is undertaken to obtain insights and ideas about the phenomena in the situation (Robson 1996; Fink, 1995). Exploratory studies, therefore, are important for the initial investigations within the research and for advancing knowledge through good theory building (Sekaran, 1992). Secondly, descriptive research is used to produce information on the phenomena of interest that already exists (Fink, 1995; Sekaran, 1992). Lastly, explanatory (or causal) research is concerned with the explanation of a situation or problem, usually in the form of cause-and-effect relationships (Churchill, 1995). In other words, explanatory studies try to predict why things take place. This may be summarised by the use of deterministic causation (one variable is a function of another) or probabilistic causation (it is more likely that one variable will be a function of another) (Ghauri et al., 1995). According to Robson (1996, p.42), "*A particular study may be concerned with more than one purpose, possibly all three, but often one will be predominate*". Based on the objectives of this research (Chapter One), and taking into consideration the definitions of the three types of the purpose of a study provided above, it seems that the survey adopted in this study is mainly exploratory in nature even though it includes some descriptive and explanatory elements.

- **The Type of Investigation:** there are two types of investigation available to the researcher. These are casual and correlational studies (Sekaran, 1992). In a causal study,

the researcher is interested to establish a definitive cause-and-effect relationship (Sekaran, 1992). In addition, some variables may have to be manipulated and others controlled. In contrast, in a correlational study, the researcher wants to identify the important factors associated with the problem (Sekaran, 1992). Moreover, it is conducted in the natural setting where events occur without researchers interfering with the variables. However, this is not always the case since a cause-and-effect relationship could be inferred through correlational studies. As Sekaran (1992, p.100) stated, "*It may be of interest to know that attempts are sometimes made to establish cause → affect relationships through certain types of correlational or regression analysis, such as cross-lagged correlations and path analysis*".

A correlational study was chosen for this research since the research aims to look at "real-life" perceptions and opinions.

- **Researcher Interference:** the extent of research interference depends on whether the study is correlational or causal. In a correlational study, the researcher is interfering minimally with the normal flow of events since such a study is conducted in the natural environment of the organisation (Sekaran, 1992). However, in a causal study where the aim is to establish cause-and-effect relationships, the research tries to manipulate certain variables in order to study the effects of such manipulation on the dependent variable of interest (Sekaran, 1992).

Based on the decision made above regarding the type of investigation (i.e. correlational study), it seems that the level of researcher interference in the present study is obvious. In other words, the researcher interference is minimal.

- **The Study Setting:** research can be conducted in contrived or in noncontrived settings. Correlational studies are invariably carried out in noncontrived settings, while rigorous causal studies are conducted in contrived lab settings (Sekaran, 1992). There are three types of study setting: these include field studies, field experiments and lab experiments. Examining various factors in the natural setting in which events normally occur, with minimal research interference, is called field study (Sekaran, 1992). However, in field experiments, cause-and-effect relationships are explored with some amount of research interference, but still within the natural setting where events normally occur (Sekaran, 1992). Lab experiments are very different since the researcher examines cause-and-effect relationships and exercises a high degree of control in an artificial setting (Sekaran, 1992).

The two decisions made above with respect to the type of investigation and researcher interference have narrowed down the study setting that can be used in this research. In other words, only the field study is applicable to this research.

- **Time Horizon of the Study:** this involves whether the research will be longitudinal or cross-sectional (Churchill, 1995). Longitudinal research refers to a study that extends over a substantial period of time and includes studying changes over time (Remenyi et al., 1998; Ghauri et al., 1995). Such studies require a lot of time and money to be invested, and results are not immediate (Remenyi et al., 1998). In contrast, cross-sectional (or one-shot) research is used to describe studies which take a snapshot of a situation in time (Remenyi et al., 1998; Ghauri et al., 1995). Such a research type is not concerned with commenting on trends or on how situations develop over a time period (Remenyi et al., 1998; Sekaran, 1992).

In the light of the above, it was decided that a longitudinal study is unnecessary because the time period was not a factor being investigated. Accordingly, a cross-sectional study was adopted to provide a snapshot of variables at one point in time.

- **Unit of Analysis:** this refers to the level of aggregation of the data during subsequent analysis (Sekaran, 1992). The unit of analysis could be, for instance, individuals, dyads (i.e. two-person), groups, organisations or countries. In the light of the research objectives, the unit of analysis for this study would be the audit firm.

- **Type of Data Collection Technique:** one of the most important aspects of a research project is to decide the technique with which evidence will be collected and analysed. There are two kinds of technique/method that may be used to collect evidence in business and management studies: qualitative and quantitative (Remenyi et al., 1998). In a qualitative method, researchers use narratives (words) to interpret the world (Remenyi et al., 1998; Denzin and Lincoln, 1994). However, in a quantitative one, researchers use mathematical models and statistical tables to relate the research in impersonal terms (Remenyi et al., 1998; Denzin and Lincoln, 1994). Generally speaking, a qualitative approach is more flexible than a quantitative technique. In contrast, a quantitative method allows more pieces of specific data to be collected in a short space of time and also with minimum bias.

Based on the nature of the study as exploratory, and also in the light of the above, it seems that the use of combined quantitative and qualitative methods would allow for greater confidence in the research findings. More discussion about the research methods used to collect study data is given in the next section.

5.5 Selection of Data Collection Methods

There are many types of data collection methods available to the researcher, but only some are applicable in particular circumstances (Churchill, 1995; Robson 1996). In other words, there are different methods which could be utilised by the researcher to gather the necessary data, such as participation, observation, interviews or questionnaires. However, choosing one or more of these methods depends on many things such as the objective of the study, the resources (time and money) at the disposal of the researcher, and the capabilities and limitations of each method. In this respect, Fowler (1984, p. 61) argues that "*The choice of data collection mode – mail, telephone, personal interview, or group administration – is related directly to the sample frame, research topic, characteristics of the sample, and available staff and facilities; it has implications for response rate, questions forms, and survey costs*".

In the light of the above, and taking into consideration the objectives of the study, it was decided that interviews, followed by a questionnaire are the most suitable methods of data collection for this research. The rationale behind the selection of these two research methods is as follows: the justifications for using interviews in this study included, firstly, the nature of the study (exploratory) which led to the use of interviews which allow the collection of a large amount of data. This is because a qualitative approach offers the researcher the opportunity to probe and follow different lines of enquiry because such an approach is generally more flexible than quantitative techniques. In other words, qualitative methods often allow for new questions and answers. Secondly, there is a dearth of literature which covers how audit firms in SA deal with IT-based accounting systems. Thus, conducting interviews should provide an insight into the phenomena being explored in the study and might help in defining the related variables.

Finally, the results of this stage (the interviews) should help in building the theoretical framework of this study. Accordingly, the justifications for following the interviews by questionnaires include the following: firstly, it enables the researcher to verify or confirm the findings (variables or issues) of the first stage (interviews) and, furthermore, a questionnaire might provide an additional insight into the phenomena being explored in the study. Secondly, the interviews were conducted with a small sample of the population (audit firms in SA) because of the wide distribution of the targeted population throughout SA. Thus, the results of interviews are useful for defining related issues and variables although such results cannot be generalised. Using questionnaires will overcome such a problem if the majority of the targeted population offers a response.

The following two sections will discuss the design of the data collection methods adopted for this research (namely, interviews and questionnaires) in detail.

5.6 Design of the First Stage: Interviews

This section details the design process of the interviews. However, it is worth explaining what is meant by the term "interview" before proceeding to highlight the procedures followed in their design. Interviews have been defined by Cannel and Kahn (cited by Robson) as: "*initiated by the interviewer for the specific purpose of obtaining research-relevant information and focused by him on content specified by research objectives of systematic description, prediction or explanation*" (Robson, 1996; p. 229).

5.6.1 Aim of the Interviews

The aim of the interviews utilised in this research is to get more in-depth information about (or explore) the current practice of audit firms in SA regarding auditing IT-based

accounting systems, and in addition, to obtain an insight regarding any problems or obstacles that may face them in an IT-based accounting environment. This was done by applying a grounded theory approach in order to develop the theoretical framework for this research.

5.6.2 Type of Interview

The type of interview can be characterised by the degree of structure and mode. In terms of structure, interviews are classified into structured, semi-structured and unstructured types (Robson, 1996; Drever, 1995; Arksey and Knight, 1999). However, in terms of mode, interviews can be conducted either personally (face to face) or by telephone (Kidder and Judd, 1986; Sekaran, 1992; Frey and Oishi, 1995). This research utilised semi-structured, personal interviews. The following explains the rationale behind this choice.

Semi-structured interviews allow the setting up of a general structure by deciding in advance what ground is to be covered and what main questions are to be asked (Drever, 1995; Arksey and Knight, 1999). The researcher is free to modify the order of the questions, the way they are worded, give explanations, leave out particular questions which seem inappropriate with a particular interviewee, or include additional ones (Robson, 1996; Arksey and Knight, 1999). Accordingly, it seems that such a technique is more suitable for the exploratory nature of this study which is guided by vague literature.

The personal interview is a face-to-face, interpersonal role situation in which an interviewer asks respondents questions designed to elicit answers pertinent to the

research hypothesis (Franfort-Nachmias and Nachmias, 1992). In a wider sense, the key element is that the respondent and the interviewer are together in the same location. The rationale behind utilising this method of interviewing is the ability of the interviewer to notice and correct the respondent's misunderstanding, to probe inadequate or vague responses, and to answer questions and allay concerns. These are important in obtaining complete and meaningful data (Czaja and Blair, 1996; Frey and Oishi, 1995; Kidder and Judd, 1986). In addition, this form of interviewing can improve the quality of data since the interviewer can best establish rapport and motivate a respondent to answer fully and accurately (Czaja and Blair, 1996; Kidder and Judd, 1986; Sekaran, 1992). Another positive aspect of this method is that it allows the greatest length in interview schedules which permit extensive in-depth questioning about complex or multifaceted issues (Kidder and Judd, 1986; Sekaran, 1992; Frey and Oishi, 1995). Thus, this method of data collection is best for the open-ended questions which have been adopted in this study (Czaja and Blair, 1996; Sekaran, 1992). Face-to-face interviews are best suited at the exploratory stages of research when the researcher is trying to get to grips with concepts or situational factors. Finally, face to face interviews allow the interviewer to pick up non-verbal cues which may help in understanding a verbal response or even reversing its meaning (Robson, 1996; Franfort-Nachmias and Nachmias, 1992; Sekaran, 1992; Czaja and Blair, 1996). However, face-to-face interviews have some disadvantages as follows: firstly, the high cost since this type of interview entails vast resources in order to be carried out nationally or internationally (Sekaran, 1992; Czaja and Blair, 1996). Therefore, there are geographical limitations associated with such an approach. Secondly, face-to-face interviews have the potential for introducing the views of the interviewer or respondent bias (Franfort-Nachmias and Nachmias, 1992; Sekaran, 1992). Interviewer bias might exist if the researcher gives cues that may influence a

respondent's answer. However, the hesitancy of respondents to report sensitive behaviour presents the possibility of respondent bias in the data. Thirdly, there is a lack of anonymity with face-to-face interviews (Franfort-Nachmias and Nachmias, 1992; Sekaran, 1992). The respondent may feel threatened or intimidated by the interviewer since he/she knows all or many of the respondents (or at least their names, addresses and telephone numbers). Finally, interviewing is time-consuming, especially if this lasts much more than an hour (Robson, 1996). Despite this, there are some techniques that can be followed by the researcher to overcome the disadvantages of face-to-face interviews. The following techniques will be useful for this purpose. Firstly, bias can be minimised by establishing rapport and trust with the interviewees through stating the purpose of the interview and assuring complete confidentiality about the source of the responses (Sekaran, 1992). In addition, it is important to ask questions in a way that would ensure the least bias in the responses (Sekaran, 1992). Moreover, it is important to avoid conducting the interviews in a setting, such as an open workplace, that might produce bias as this might prevent the respondent from replying frankly and honestly (Sekaran, 1992). Secondly, regarding the length of the interview, the interview should take a reasonable time, usually between half an hour and one hour (Robson, 1996). In addition, a convenient time must be set for both parties.

5.6.3 Main Contents of the Interviews

As was discussed above, the interviews seek to elicit the perceptions of representatives of the audit firms in SA regarding several issues. Such issues have been divided into seven main parts (The English version of interviews is included in Appendix 5.1 and the Arabic version is found in Appendix 5.2). The elements of each part are outlined as follows.

The first part consists of general information which includes many aspects, such as the size of the audit firm, the size and the nature of their clients, the proportion of their clients who have IT-based accounting systems, and the types of IT-based accounting systems that their clients have. The second part focuses on the problems that may arise as a result of adopting an IT-based accounting system. This part tries to investigate many issues such as the reliability of accounting software, the loss of the audit trail, and fraud. The Saudi audit standard in this environment "*Audit Standard in Organisations that Use the Computer*" that was issued by SOCPA in 1997 is examined in Part Three. In particular, the interview schedule attempts to evaluate the appropriateness of this standard. Moreover, it examines whether audit firms made any changes in their policies as a result of the issue of that standard. The fourth part explores audit approaches or techniques that are used by audit firms when auditing IT-based accounting systems. In other words, it attempts to investigate how audit firms evaluate the reliability of the accounting systems of their clients; whether they use CAATs and, if not, why; what sort of problems face them when they examine internal controls in IT-based accounting systems and how they overcome them. Part Five deals with the ability and experience of auditors who audit in an IT-based accounting environment. More specifically, it considers the extent of knowledge that audit firms require of auditors in order to audit financial statements prepared by IT-based accounting systems and whether they received any training to improve their knowledge in this area or not. Furthermore, it explores whether audit firms employ IT specialists within their audit team and, if not, why this so. Part Six investigates whether any financial constraints have an impact on the audit approach of firms in respect of IT-based accounting systems, the training the audit staff who deal with such systems, and the purchasing of generalised audit software. The final part looks into the future of the profession considering the increased

adoption of IT-based accounting systems by the business sector and also the advent of electronic commerce.

5.6.4 Source, Type and Wording of the Interview Questions

Since the main purpose of this study was to investigate the impact of the adoption of IT-based accounting systems by clients on the level of audit risk, the author depended on three main sources for the construction of the interview questions: firstly, the auditing literature review which the author was able to identify at the time of conducting this study. This literature deals with the impact of IT on the audit function and the potential risks that are associated with IT-based accounting systems in a Western context and also the Saudi audit standard in this environment that was issued by SOCPA in 1997 (Chapters 3 and 4); secondly, through discussion with the supervisor of the study; and finally, some questions have been explored through conducting the interviews with staff of the audit firms in SA.

The interview questions included two types: open-ended and closed-ended questions. Most were deliberately designed as open-ended since this type of question allows the interviewees to offer their interpretations, attitudes and perceptions regarding the explored issues.

Taking into consideration that the language and the order of the interview questions might have an effect on the respondents' answers, care was taken to avoid double-barrelled, ambiguous, leading and loaded questions. In addition, the funnel technique

was used[4].

5.6.5 Sample Selection of Interviews

The target population of the study was audit firms in Saudi Arabia. The sample for the interviews was selected randomly from a list of firms in two cities, Riyadh and Buraidah. Riyadh is the capital of Saudi Arabia and where most business companies and audit firms are based, while Buraidah is an agricultural city and the nearest city to Riyadh. The rationale behind choosing these cities is to ensure that all sizes of audit firms are represented in this study because of the lack of formal classification for audit firms in SA in terms of size. Moreover, it also reduces the cost of the interviews and the time taken to complete them. This provided a sample of 19 audit firms. Sixteen of these were based in Riyadh and three in Buraidah.

5.6.6 Correspondence with the Selected Sample

In order to conduct face-to-face interviews with the staff of audit firms in SA, a letter was sent by fax to each audit firm in the selected sample (a sample of the English and Arabic versions of this letter are provided in Appendix 5.3 and Appendix 5.4). The letter explains the reasons for the survey, the importance of interviewing each sample audit firm, the use that will be made of the data, and the confidentiality of the respondent's answers. This was also supported by a letter from the supervisor of this study (a copy of this letter is included in Appendix 5.5).

[4] Since these guidelines were taken into consideration in writing the questionnaire questions as well, the explanation of such guidelines will be provided later in Subsection 5.7.2.2.

5.6.7 Follow-up Phone Calls

Only two audit firms called back and set a time for carrying out interviews with their staff. Due to the low response rate, the researcher used telephone reminders as the main follow-up strategy to increase the overall response rate. After conducting 17 follow-up phone calls, it was found that 26 % of audit firms did not receive the letter which was sent by fax (even though their fax numbers which were recorded in the list issued by SOCPA had not been changed). Thus, the letters were sent to them again. As a result of 40 other follow-up phone calls made by the researcher, two important issues emerged which might have caused the low response rate. Firstly, most, if not all, audit firms were concerned mainly with time. This was because of the nature of the study which consisted of face-to-face interviews and also the timing of the study since it was carried out between 5th January and 10th February 2001 which is a busy time for them. Secondly, firms were concerned about centralisation since this matter had to be approved by top management and this task takes time. However, only four audit firms stated that they were not willing to be interviewed. The excuses that were mentioned by them for not responding and also for their unwillingness to allow interviews with their staff are shown in Table 5.1.

Table 5.1: Reasons Mentioned by Audit Firms for not Responding or being Unwilling to be Interviewed.

	Number of audit firms which refused to allow interviews	
	3 Audit Firms	***1 Audit Firm***
Reasons for not responding or being unwilling to do interviews	You came in the busy season and you should wait until we call you back when it is quiet but if we have a questionnaire we will be happy to complete it.	You must get permission from the manager. He is away now and we do not know when he is coming back.

5.6.8 Response Rate of Interviews

Fifteen out of nineteen audit firms allowed interviews with their staff. Thirteen of these were in Riyadh and two in Buraidah. This yielded an overall response rate of 78.9%, as described in Table 5.2.

Table 5.2: Response Rate of Interviews

City	*Number of audit firms selected as a sample*	*Number of audit firms which allowed interviews*	*Response Rate*
Riyadh	16	13	81.25%
Buraidah	3	2	66.66%
Cumulative Total	***19***	***15***	***78.9%***

5.6.9 Carrying out the Interviews

All interviews with participants were conducted in the work place except one which was held in a hotel in Buraidah. The interviews lasted between one and two hours depending on the participant. Thus, the average time was generally one and a half hours. The interviewer tried to make sure that interviewees understood what was meant by each question, and thus, a definition of some terms was explained to them. Generally speaking, interviewees spoke fairly freely. However, the researcher faced a problem when taping the interviews. It was found from the first and second interviews that participants did not like being involved in taped interviews and it was thought that seeking permission to tape interviews with the participants might threaten the quality of data in terms of the interviewees' willingness to discuss sensitive and confidential issues. As a result, no interviews were taped and instead, all answers were recorded by

hand[5]. As the researcher took extensive notes (and sometimes recorded the exact answer) during interviews, it was possible to recreate most of the answers satisfactorily, particularly as the transcribing was done immediately after the interview. The findings of this stage (i.e. interviews) are provided in Chapter Six. These findings were utilised, with the literature reviewed in Chapters Three and Four, in the construction of the theoretical framework of this study as will be presented in Chapter Seven. In addition, the interviews helped in developing the questionnaire that was then used in this study.

The following section will present the design of the second stage (i.e. the questionnaire).

5.7 Design of the Second Stage: the Questionnaire

This study utilised the questionnaire as the main research method. However, before highlighting the procedures that were followed in order to design the questionnaire, it is worth defining the term. The questionnaire has been defined by Sekaran (1992, p. 200) as "*a preformulated written set of questions to which respondents record their answers, usually within rather closely defined alternatives*". A questionnaire has to be totally self-explanatory; the importance of clear and simple statements cannot be overstated, since instructions and questions must be uniformly understood by a wide variety of respondents (Czaja and Blair, 1996). However, when such an approach is used, the important variables have to be known in advance. Thus, it is best suited for use in relatively well understood situations. For instance, in this research, conducting

[5] The researcher appreciated the time which was given by interviewees in order to write down their answers during the interviews.

interviews (the first stage) helped in building the questionnaire that was utilised in this study.

5.7.1 Purpose of Questionnaire

It was mentioned above that the theoretical framework of this study is mainly based on the findings of the interviews conducted with a small number of audit firms in SA. Accordingly, it was decided to test this theoretical framework with a much larger sample. In other words, the purpose of the questionnaire is to support or refute theoretical propositions.

5.7.2 Questionnaire Design

This subsection explains the procedures that were followed in order to develop the questionnaire of this study. It focuses on the type of questionnaire, wording and the sequence of the questionnaire's questions, the scale development, and the physical characteristics of the questionnaire. The following will cover each one of these:

5.7.2.1 Type of Questionnaire

This study used a mail questionnaire. Generally speaking, a mail questionnaire has the following advantages: firstly, it permits wide geographic contact at minimal cost (Franfort-Nachmias and Nachmias, 1992; Sekaran, 1992). It can be used for contacting a large number of people. Secondly, it enables the collection of a great amount of data (Czaja and Blair, 1996). Thirdly, it saves a lot of time and makes a useful contribution in simplifying the analysis of the data that will be collected (Sekaran, 1992; Czaja and Blair, 1996). Fourthly, it avoids researcher bias (Franfort-Nachmias and Nachmias, 1992; Sekaran, 1992) and finally, it avoids the difficulty of making arrangements for

setting appointments with intended participants as is the case in conducting interviews (Sekaran, 1992; Czaja and Blair, 1996). In other words, it suits busy participants since they can complete the questionnaires at their own convenience, in their homes, and at their own pace. However, the mail questionnaire has two main limitations. These limitations include the low return rate of mail questionnaires and the difficulty of clarifying any doubts the respondents may have (Sekaran, 1992; Czaja and Blair, 1996; Nachmias and Nachmias, 1992). Despite this, these disadvantages could be overcome through the following: firstly, increasing the size of the sample in order to increase the number of questionnaires that will be sent back; secondly, sending follow-up letters (Fink, 1995; Sekaran, 1992) and thirdly, providing the respondents with self-addressed and stamped return envelopes to encourage them to respond (Robson, 1996; Sekaran, 1992). Fourthly, it helps to make the questionnaire as short as possible (Fink, 1995; Sekaran, 1992) and finally, conducting a pre-test and pilot study will help to clarify any vagueness in the questionnaire (Czaja and Blair, 1996; Sekaran, 1992).

5.7.2.2 Wording and Sequence of the Questionnaire Questions

The implications of the quality of questions included in the questionnaire, in terms of wording and sequence, on the research results have been considered in the research method textbooks (e.g. Czaja and Blair, 1996; Fowler, 1995; Franfort-Nachmias and Nachmias, 1992; Sekaran, 1992). In particular, they recommend principles or guidelines for the wording and sequence of questions. The following includes some of these guidelines which should be taken into consideration in writing the questions of the questionnaire. Firstly, the content of the question should be identified. Survey questions may be concerned with subjective feelings or objective facts (Franfort-Nachmias and Nachmias, 1992; Sekaran, 1992). Generally speaking, this study focuses on measuring

the respondents' perceptions regarding the explored issues. Secondly, simple language must be used. In wording questions, the researcher tried to select easy, simple and understandable words. Thirdly, double barrelled and ambiguous questions should be avoided. Double-barrelled questions refer to those which combine two or more issues at the same time; while ambiguous questions refer to those that do not have specific meaning (Czaja and Blair, 1996, Sekaran, 1992). Fourthly, leading and loaded questions should be avoided. Designing the question in way that will direct respondents to a particular answer is called a leading question, while loaded questions are those which are phrased in an emotionally charged manner (Franfort-Nachmias and Nachmias, 1992; Sekaran, 1992). Fifthly, the type of questions must be determined. Questions in a questionnaire can be either open-ended or close-ended. The majority of the questions included in the questionnaire are close-ended because they have several advantages: for example, the structure of such questions makes them easy to ask and quick to answer. In addition, the answers could be analysed in quantitative terms and provide better comparability between respondents. Finally, attention was paid to the sequence of the questions in order to facilitate the smooth progression of the respondent through the questionnaire. This was achieved through using the funnel approach where the respondent is led from general to specific questions and from easy to more difficult questions.

5.7.2.3 Scale Development

The questionnaire has, in total, 21 questions (The English version of the questionnaire is found in Appendix 5.6 and the Arabic version is provided in Appendix 5.7). Generally speaking, these questions were constructed to measure the variables of interest. In constructing these questions, different scales were developed to assess these variables.

However, the researcher tried to use the most powerful scales possible. The following points provide a description of the measurement scales of the operational variables.

A. The lack of understanding of IT of the clients' management: Two items were included in the questionnaire to assess the respondents' attitudes towards this variable. The type of scale that was used with these items was interval. In other words, the respondents were asked to indicate their opinions with regard to each statement on a 5-point Likert scale, with 1 = strongly disagree and 5 = strongly agree.

B. The unsuitability of the clients' accounting software: One item was used to measure participants' perceptions in relation to the unsuitability of their clients' accounting software. The scale that was used in this item was the interval scale. In particular, the respondents were asked to rate on a 5-point Likert scale their opinions with respect to this statement, with 1 = never and 5 = always.

C. The clients' financial cost concern: This variable was measured by four items. The type of scale that was used with these items was the interval scale. In more detail, respondents were asked to express their opinions regarding each statement on a 5-point Likert scale, with 1 = strongly disagree and 5 = strongly agree.

D. The lack of education in IT of clients' staff: One item was included in the questionnaire to assess the respondents' attitudes towards this variable. The interval scale was used with this item. In this context, the participants were asked to rate on a 5-point Likert scale, with 1 = strongly disagree and 5 = strongly agree, their opinions with respect to this statement.

E. The lack of clients' staff training in IT: This variable was measured by one item. The type of scale that was used with this item was the interval scale. In particular, respondents were asked to express their perceptions with respect to this statement on a 5-point Likert scale, with 1 = strongly disagree and 5 = strongly agree.

F. The lack of competence of clients' staff in dealing with IT-based accounting systems: One item was included in the questionnaire to measure the participants' perceptions in relation to this variable. In this context, the participants were asked to rate on a 5-point Likert scale, with 1 = never and 5 = always, their opinions with respect to this statement.

G. The level of inherent risk: There were two items that were used to assess the level of inherent risk. The interval scale was used with these items. In more detail, respondents were asked to indicate their opinions regarding these statements on a 6-point Likert scale, with 1 = no contribution and 6 = very high contribution.

H. The weakness of the clients' internal control systems: One item was included in the questionnaire to measure the respondents' attitudes towards this variable. The interval scale was used with this item. In particular, the respondents were asked to rate on a 5-point Likert scale, with 1 = never and 5 = always, their opinions with respect to this statement.

I. The level of control risk: This variable was measured by one item. The type of scale that was used with this item was the interval scale. In more detail, respondents were asked to express their perceptions with respect to this statement on a 6-point Likert scale, with 1 = no contribution and 6 = very high contribution.

J. Inappropriateness of the Saudi audit standard to the IT-based accounting environment: This variable was measured by one item. The scale that was used with this item was the interval scale. In other words, the participants were asked to rate on a 5-point Likert scale, with 1 = strongly disagree and 5 = strongly agree, their opinions with respect to this statement.

K. The audit firms' financial cost concern: Three items were included in the questionnaire to assess the respondents' attitudes toward this variable. The type of scale that was used with these items was an interval. In particular, the respondents were asked to indicate their opinions in relation to each statement on a 5-point Likert scale, with 1 = strongly disagree and 5 = strongly agree.

L. The lack of auditors' education in IT: One item was included in the questionnaire to measure the respondents' attitudes towards this variable. The interval scale was used with this item. In this context, the participants were asked to rate on a 5-point Likert scale, with 1 = strongly disagree and 5 = strongly agree, their opinions with respect to this statement.

M. The use of the auditing around the computer approach: This variable was measured by one item. The scale that was used with this item was the interval scale. In particular, the respondents were asked to indicate their opinions in relation to this statement on a 5-point Likert scale, with 1 = never and 5 = always.

N. The lack of IT training for auditors: One item was included in the questionnaire to assess the respondents' attitudes towards this variable. The interval scale was used with this item. In particular, the respondents were asked to rate on a 5-point Likert scale,

with 1 = strongly disagree and 5 = strongly agree, their opinions with respect to this statement.

O. The lack of competence of auditors in auditing IT-based accounting systems: This variable was measured by one item. The type of scale that was used with this item was an interval. In more detail, respondents were asked to express their perceptions with respect to this statement on a 5-point Likert scale, with 1 = strongly disagree and 5 = strongly agree.

P. The level of detection risk: There were two items that were used to assess the level of detection risk. The scale that was used with these items was the interval scale. In particular, respondents were asked to indicate their opinions regarding these statements on a 6-point Likert scale, with 1 = no contribution and 6 = very high contribution.

5.7.2.4 Physical Characteristics of the Questionnaire

The appearance of the questionnaire is vital (Robson, 1996; Franfort-Nachmias and Nachmias, 1992; Sekaran, 1992). The layout of the questionnaire may have an impact on the interest level of the respondents and the amount of time they are willing to devote to filling it in. The questionnaire layout included the following:

*A. **Covering Letter:*** The questionnaire was accompanied by a cover letter (a sample of the English and Arabic versions of this letter are found in Appendix 5.8 and Appendix 5.9 respectively). In this letter, the identity of the researcher was disclosed as a student from Imam University in SA studying for his Ph.D. at Loughborough

University in the UK. The supervisor of the study was also disclosed. In addition, the letter indicated the title and the purpose of the study, assuring moreover the confidentiality of the information provided by the respondents. This letter ended with an expression of thanks the respondents for taking the time to respond to the questionnaire and for their kind co-operation.

B. Page Layout: The titles of sections were differentiated by using bold typeface. In addition, questions were numbered and preceded the responses. Moreover, instructions were offered on how to fill in the questionnaire to aid the respondents in answering the questions without difficulty (e.g. the majority were simply circle the suitable answer). In order to separate the questions, white spaces were used between them. Page numbers were provided at the bottom of each page to help the researcher.

C. Structure of the Questionnaire: The questions of the questionnaire were organised in such a way to make sense to the respondents and to reduce their need to page back and forth. In other words, the questions were organised logically through dividing the questionnaire into five sections as described briefly below:

Section One: This section was developed to gain background information about the audit firms surveyed. This information includes the size of the audit firm, the proportion of clients who use IT-based accounting systems, and the proportion of clients who use integrated and stand-alone IT-based accounting systems.

Section Two: This section of the questionnaire was designed to explore the respondents' perceptions of the possible problems that might face them while auditing in a client's IT-based accounting environment and also the reasons behind such problems.

Section Three: This section was developed to explore the views of participants with

regard to four main themes. The first theme deals with exploring the potential perception of participants regarding some obstacles that might make "*Audit Standard in Organisations that Use the Computer*" issued by SOCPA in 1997 inappropriate for an IT-based accounting environment in SA. The second theme involves exploring the type of audit approach that is adopted by audit firms to examine the reliability of internal controls in IT-based accounting systems; it also investigates the reasons that might prevent audit firms from applying CAATs. The third theme explores the type of knowledge of IT which is required by audit firms for auditors who audit IT-based accounting systems. In addition, it investigates whether the audit firms provided IT training for their staff and, if so, the level of training given in certain IT related areas. The fourth theme attempts to investigate the participants' perceptions with respect to some factors that might influence the competence of auditors in such an environment.

Section Four: This section of the questionnaire was constructed in order to examine the participants' perceptions concerning the contribution of some factors which might increase the overall level of audit risk in an IT-based accounting environment.

Section Five: This section was about the respondents' comments and/or additions to any answers given in the previous sections.

Table 5.3 Subjects Covered in the Different Sections of the Questionnaire

Section	*Number of questions*	*Subject covered*
One	3	General information
Two	7	Clients' IT-based accounting environments
Three	9	The audit approach in the IT-based accounting environment
Four	2	Audit risk in an IT-based accounting environment
Five		The respondents' comments on the questionnaire

Before proceeding to explain how the questionnaire of this study was pre-tested and piloted, it is worth highlighting the steps that were followed in order to ensure the sound translation of the questionnaire. This objective will be the aim of the next section.

5.7.3 Translation of the Questionnaire

Originally, the questionnaire was constructed in English. However, since the general language of the target population is Arabic, the questionnaire had to be translated into Arabic. This was done through the following steps:

1- The researcher prepared a preliminary translation of the questionnaire (first draft).

2- To ensure the accuracy of the translation, the first draft of the translation was sent to a translation firm in Saudi Arabia by email; the firm produced an official translation of the questionnaire (second draft).

3- In order to check the Arabic grammar, the second draft was sent to a specialist in the Arabic language at Imam University in Saudi Arabia. After reviewing, only minor corrections were made. Accordingly, the final draft of the questionnaire was prepared.

5.7.4 Questionnaire Pre-testing and Piloting

Pre-testing and piloting are necessary and important steps in the development of the questionnaire (Litwin, 1995; Remenyi et al., 1998; Czaja and Blair, 1996). In particular, questionnaire pre-testing and piloting are the key to good design and administration (Bourque and Fielder, 1995). In a wider sense, they provide valuable information about how the survey instrument actually works in the field (Litwin, 1995). In the case of the questionnaire, they are utilised to refine its design through detecting fallacies, hidden problems etc., thus ensuring the suitability of the questions (Fowler, 1995; Remenyi et

al., 1998; Czaja and Blair, 1996). In order to achieve this, pre-testing and piloting are usually conducted prior to the actual data collection (Bourque and Fielder, 1995). The following subsections include details about the pre-test and the pilot study that were used in this research.

5.7.4.1 Questionnaire Pre-testing

The pre-test is the informal approach to test the survey instrument (Remenyi et al., 1998). Pre-testing includes a set of procedures used to determine whether the questionnaire works in the manner intended by the research (Fowler, 1995; Czaja and Blair, 1996). In particular, it is utilised to ensure clarity and precision in the design of the questionnaire (Remenyi et al., 1998). In other words, it assesses the decisions, assumptions and judgements that were made by the researcher in the first draft of the survey questions about what respondents will know, what words they will understand, what sort of information they can and will provide, and what response tasks they can perform (Czaja and Blair, 1996).

The purposes of pre-testing the questionnaire of this thesis include, among others, the following: an assessment of individual questions and their sequence, determining the degree of accuracy in question and response wording, discovering difficulties with understanding instructions or layout, and increasing the ease of analysis. The following points highlight how the pre-testing process was polished and offer the results of this test.

A) Polishing the Pre-test

The process of pre-testing the questionnaire was carried out in two phases. In the first

phase, a copy of the covering letter and the questionnaire were circulated among postgraduate students in the Business School at Loughborough University and they were also sent to some Saudi students who are studying for PhDs in auditing in other UK universities. In the second phase, a copy of the revised version of the questionnaire with the covering letter was sent to two staff in the Business School at Loughborough University.

B) The Results of the Pre-test

Useful comments and suggestions resulted from the above two phases of the pre-testing process. These comments and suggestions were used to refine the questionnaire and the covering letter in order to prepare the questionnaire for the pilot study. Table 5.4 shows these comments and suggestions and the action that was taken as a result.

Table 5.4 Results of the Questionnaire Pre-testing

Section	Comments and suggestions	Action taken
Covering Letter	• Print the cover letter on official university paper in order to encourage participants to respond when they are sure that their answers will be used for academic purposes only. • Write your address and any other contact numbers for further clarification that might be required by respondents.	• The cover letter was printed on official university paper • The complete address was added and also mobile and fax numbers
Section One	• The term "IT-based accounting systems" should be defined. • Change the scale of Questions 2 and 3 from ordinal scales to ratio scales to get more information. • Question 3 was double barrelled since it asked about the proportion of clients who use integrated systems and also stand-alone systems in one sentence. Separate them by using letter (A) for the first type, and letter (B) for the other type. • The terms "an integrated accounting system" and "a stand-alone accounting system" should be defined.	• It was defined • They were changed • It was corrected • They were defined

Continued overleaf

Table 5.4 (Continued)

Section	Comments and suggestions	Action taken
Section Two	• Revise the coding in Questions 4, 5, 7, 8 and 10 where low numbers stand for "never" or "disagree", while high numbers stand for "always" and "agree". • Change the scale of Question 6 from an ordinal scale to a ratio scale to get more information.	• They were revised. • It was changed
Section Three	• In Question 17, please add "None" to multiple choice answers for this question since some participants might not provide training in some IT areas at all.	• It was added
Section Four	• In Question 20, please add "No contribution" to multiple choice answers for this question since some participants might not agree on the contribution of such factors at all.	• It was added

5.7.4.2 Questionnaire Piloting

When the questionnaire has been pre-tested, it is ready for the pilot study (Czaja and Blair, 1996). In a pilot study, the questionnaire is tested using a sample from the targeted population and also using the same procedures that will be used in the main study (Bourque and Fielder, 1995). In short, it is a small scale version of the main study and, in turn, it covers some aspects of the data collection process that pre-testing alone may not address (Remenyi et al., 1998; Czaja and Blair, 1996). In a wider sense, it helps the researcher to estimate how much the data collection will cost in time and money, and also predicts whether any serious problems are likely to be encountered in the main study (Bourque and Fielder, 1995; Remenyi et al., 1998).

The aim of performing the pilot study in this research includes, among others, the following: gaining confidence that no essential issues have been missed, predicting the response rate, determining the best follow-up strategy, ensuring the reliability and validity of the measures used to measure the variables of interest, and getting feedback regarding the wording and general appearance of the questionnaire. The following subsections explain the method that was used to perform the pilot study and the results that were gained from it.

A) Performing the Pilot Study

The pilot study was performed in the same way that was to be used in the main study. In particular, the final draft of the questionnaire was sent by fax to eight audit firms in Saudi Arabia with a cover letter (a sample of the English and Arabic versions of this letter are included in Appendix 5.10 and Appendix 5.11 respectively). The aim of the cover letter was to explain the purpose of the study and also to ask the representatives of the audit firms to fill in the questionnaire and, at the same time, to tell the researcher if there were any unclear or ambiguous questions. In addition, they were asked if there were any questions which should be added or deleted. Finally, they were asked to indicate approximately how long it took to fill in the questionnaire.

The rationale behind the use of eight audit firms as a sample is to reduce the time and cost required to implement the pilot study. In addition, it is because the number of such firms in SA is limited, as will be discussed later in Subsection 5.7.6.

B) Follow up Strategy and Response Rate

The researcher phoned the eight audit firms and asked them if they could send back their responses within two weeks. After two weeks only two responses had been

received (25 % of the total). As a result of this low response rate, the author decided to use a follow-up strategy in order to increase the response rate, as suggested by the literature. Several strategies were suggested by the literature such as postcard reminders, second mailing, telephone reminders, and Dillman's multiple follow-up strategy which includes all the three strategies (Fox et al., 1998). However, it was found that when the telephone numbers are available, there will be no significant differences between response rates of the four follow-up strategies (Fox et al., 1998). Since the telephone numbers of the audit firms in SA were available through an updated list of these firms provided by SOCPA, the researcher selected telephone reminders as the main follow-up strategy for the pilot and also the main study. This selection was supported by the experience of the researcher in dealing with audit firms when he was arranging for interviews with them. After 15 phone calls, another three questionnaires (37% of the total) were received by the end of the third week. Accordingly, the researcher actually received five out of the eight which had been distributed (i.e. a response rate of 62%).

C) The Results of the Pilot Study

Most of the comments from the pilot study revealed that the questionnaire was easy to understand and answer. Furthermore, the respondents considered that all questions related directly to the topic.

5.7.5 Assessing the Validity and Reliability of the Research Variables

Generally speaking, it is difficult to assess the quality of data that is collected. However, it is easier to assess the appropriateness of the survey instrument that was used to collect the data (Litwin, 1995). This assessment could be gained through looking at the validity and reliability of the research variables (Fowler, 1995; Fink, 1995; Czaja and Blair,

1996). In a wider sense, validity and reliability are used to refine the data collection method. Accordingly, it is imperative to examine the validity and reliability of the research variables in the pre-test and the pilot study in order to provide an assessment of the ability of respondents to provide useful answers regarding these variables (Czaja and Blair, 1996; Litwin, 1995). Validity is concerned with providing assurance that the measures capture what are they are supposed to do (Ghauri et al., 1995; Litwin, 1995; Fowler, 1995). Reliability, on the other hand, refers to the stability and consistency of the instrument's measurements (Fink, 1995; Sekaran, 1992; Litwin, 1995). In other words, it is concerned with the degrees of variation among participants (Litwin, 1995; Sekaran, 1992). It is worth mentioning that assessing the reliability of a measure is necessary but is not sufficient to ensure its validity. In contrast, valid instruments are always reliable (Fink, 1995; Sekaran, 1992; Litwin, 1995).

Two types of validity assessment were used in this research to test the validity of the variables' measures. The first type was face validity which points out that the items that are supposed to measure a variable, do, on the face of it, look as if they are measuring the variable (Sekaran, 1992; Litwin, 1995). This was done during the pre-testing process where doctoral students (some of them in accounting and auditing fields) and some staff were asked to review the items and questions included in the questionnaire and assess their appropriateness. The second type was content validity which ensures that the measure is representative of the variable that it is supposed to measure (Sekaran, 1992; Litwin, 1995). Such a type of validity assessment is typically obtained through a review of the content of the survey by experts who have some knowledge of the subject matter to ensure that it includes everything it should and does not include anything it should not (Litwin, 1995). This was performed through the pilot study since

the participants were asked, among others as highlighted above, to tell the researcher if there were any questions or items which should be added or deleted. The results revealed that the measures that were used to measure the variables of interest were valid in terms of their face and content. The reliability of variables' measures, on the other hand, was determined through subjective testing. This is because the number of participants in the pilot study was small and, in turn, it was inappropriate to carry out any statistical reliability coefficient testing[6].

After completing validity and reliability tests, the questionnaire was ready for implementation. However, before proceeding to describe the implementation of the questionnaire, it is imperative to determine the size of the sample required for such implementation. This will be the subject of the next subsection.

5.7.6 The Sample Process

The sample process is important in establishing the representativeness of the sample for generality (Sekaran, 1992). Drawing a representative sample for a research project requires certain steps which include, defining the population, identifying the sampling frame, determining the sample size, and selecting the sample elements (Sekaran, 1992; Diamantopoulos and Schlegelmilch, 1997). Some of these steps were sketched in Subsection 5.6.5, and they will be extended here as follows. The first step in the process of sampling is defining the population. A population refers to the entire group of people or things of interest that the researcher aims to investigate (Sekaran, 1992). The population in the present research includes all audit firms in Saudi Arabia. The second

[6] The number of participants in the pilot study was five, as mentioned and justified above. According to Roscoe (cited by Sekaran, 1992), a minimum number of 30 participants is required in order to generalise.

step involves identifying the sample frame. This is the listing of the elements from which the actual sample will be drawn (Churchill, 1995). This differs from the whole population, as it is only one means by which the population may be presented. The sampling frame for this study was a list of 108 audit firms, issued by the Saudi Organisation for Certified Public Accountants in August 2001. Determining the sample size is the third step in the process of sampling. In this study, the sample size is the total population except the audit firms that participated in the pilot study[7] (the researcher did not send a questionnaire to the audit firms that participated in the pilot study since there is no difference between the pilot questionnaire and the final questionnaire). In other words, the main questionnaire was sent to audit managers or partners in 100 audit firms in SA. The reason behind this is because the number of such firms in SA is limited, amounting to 108 firms, as mentioned above. In addition, it is in order to make sure that all sizes of audit firms in SA are represented in this research since there is no formal classification for them. The final stage in the process of sampling is selecting sample elements. An element is a single member of the population (Sekaran, 1992). In this research each audit firm is an element.

5.7.7 Implementation of the Questionnaire

The questionnaire was sent to audit firms in the middle and at the end of September, 2001. Three methods were used in administering the questionnaire, according to the preference of each audit firm. These methods were: fax, mail and personal delivery[8]. The researcher phoned each audit firm and asked them if they would accept receipt of the questionnaire by fax and, if not, what method they preferred. Generally speaking,

[7] The pilot questionnaire was sent to 8 audit firms as reported in Subsection 5.7.4.2.
[8] The personal delivery method was used mainly in distributing the questionnaire in the city where the researcher lives, and rarely in the follow-up.

most audit firms accepted receiving and sending back the questionnaire of the study by fax, though some audit firms preferred mail. The reason for the researcher's preference for fax rather than mail is that in SA mail usually goes to post office boxes and not directly to the recipient's location. Thus, using fax facilitates tracing the arrival of the questionnaire and also increases the response rate. In addition, this method saves time and effort.

After sending the questionnaire by fax to each audit firm, the researcher phoned them to ensure that they had received it clearly and completely[9]. In addition, he asked them to indicate how long they needed to complete the questionnaire and send it back. Generally speaking, most of respondents asked for one month.

5.7.7.1 The Main Survey Follow-up

After giving the respondents the time asked for, and in particular at the beginning of November 2001, only 35 questionnaires had been received (i.e. 35% of the total). In order to encourage those who had not yet responded, the researcher used two ways of following up: firstly, he phoned the audit partners or audit managers in these firms. Some of them asked the researcher to send the questionnaire again by fax and write their names on it. As a result of (roughly) 200 phone calls, another 25 questionnaires were received. Secondly, and due to the time constraints, the author went to the capital of Saudi Arabia (Riyadh) to visit those who had not responded so far. The result of this visit was that 6 questionnaires were collected personally.

[9] The researcher faced problems in sending the questionnaire by fax. In particular, some audit firms did not receive it completely or it was received partially for reasons such as the fax ran out of paper, film needed to be replaced, breakdown occurred at the time of sending, and phone lines were inoperative.

5.7.7.2 The Main Survey Response Rate

Responses to the questionnaire are illustrated in Table 5.5. Only 66 questionnaires were received out of the 100 questionnaires that were originally sent. This yielded a response rate of 66%.

Table 5.5 Main Survey Response Rate		
Mode	Number of questionnaires distributed	Number of questionnaires received
Fax	71	57
Mail	27	8
Personal	2	1
Total	***100***	***66***

5.7.8 Overall Response Rate

Since there is no difference between the pilot questionnaire and the final questionnaire distributed in the main survey, the replies from the pilot study were considered to be part of the overall responses and were included in the analysis. This yielded an overall response rate of 65.7%, as described in Table 5.6. According to Remenyi et al., (1998), a response rate of 60 per cent is seen to be exemplary. In this respect, Gillham (2000, p.14) suggested that " *A 30 per cent return has to be seen as fairly satisfactory, and more than 50 per cent is good*".

Table 5.6 Overall Response Rate			
Source	Number of questionnaires distributed	Number of questionnaires received	Response rate
Pilot study	8	5	62.5%
Main study	100	66	66%
Total	**108**	**71**	**65.7%**

5.8 Data Analysis

This section seeks to highlight the techniques that were used to analyse the findings of the interviews and questionnaires.

5.8.1 Interviews

The main approach that was used for analysing and summarising the data in this stage was content analysis. This approach was defined by Krippendorff (cited by Robson, 1996, p. 272) as "*Content analysis is a research technique for making replicable and valid inferences from data to their context*". In a wider sense, it is a process of establishing a fuller and more detailed meaning of a portion of document, manuscript, speech or any type of communication (Franfort-Nachmias and Nichias, 1992; Robson, 1996; Remenyi et al., 1998). Accordingly, this approach can be adapted for use, among other things, in the analysis of qualitative interviews (Robson, 1996). The findings of this stage are presented in Chapter Six.

5.8.2 Questionnaires

All questionnaire responses were coded and entered into the data analysis package "SPSS" (Statistical Package for the Social Sciences). It is worthwhile providing justifications for utilising parametric statistical tests before proceeding to explain the three stages of data analysis that will be presented in this research. The first justification is based on the type of scale that was used in constructing the questions of the questionnaire. In particular, the Likert scales that were used in almost all the questions were treated as interval scales throughout the analysis and not as ordinal scales. In this respect, some authors (e.g. Kerlinger, 1964) argue that if ordinal measures are used as though they were interval, researchers can err seriously in interpreting data and the

relations inferred from data. On the other hand, if researchers stick strictly by the rules, they cut off powerful modes of measurement and analysis and they are left with tools that are inadequate for solving the problems which need to be solved (Kerlinger, 1964). In the same aspect Diamantopoulos and Schlegelmilch (1997, p.30) stated that "*If we adopt the pragmatic view followed by most social researchers, then we would treat the Likert scales as if they were interval. It is recommended, in this context, to appropriately number the response alternatives on the scale so as to communicate to the respondent that the intervals between the scale points are intended to be equal distance. On the other hand, if we adopt the purist view most commonly followed by statisticians, then the Likert scale should be treated as ordinal (unless we can prove otherwise)*". In the light of the above, particularly by adopting the pragmatic view, and since the author is a social researcher and not a statistician, this study treated the Likert scales as interval scales. In addition, this study followed the work of previous researchers such as Clegg et al. (1989) and Al-Mushayt (2000).

The other justification for using parametric statistical tests is connected with the distribution of the respondents' perceptions regarding research variables (i.e. Normal distribution v. Non-normal distribution). The test of normality revealed, based on the values of skewness and kurtosis of all the respondents' perceptions on the research variables included in the questionnaire, that the research variables are nearly[10] normally distributed. (For more details about the results of these tests, see Appendix 5.12.)

[10] Bryaman and Cramer (2001, p. 92) argue that "*The term "normal" is potentially very misleading, because perfectly normal distributions are very rarely found in reality. However, the values of a variable may approximate to a normal distribution and, when they do, we tend to think of them as having the properties of a normal distribution. Many of the most common statistical techniques used by social scientists presume that the variables being analysed are nearly normally distributed*". In the same aspect, Coakes and Steed (1999, p. 30) stated that "*Variables rarely conform to a classic normal distribution. More often, distributions are skewed and display varying degree of kurtosis*".

The discussion now continues by presenting the stages of data analysis and the different statistical tests that will be conducted in each stage. In particular, the data analysis will be presented in three stages as follows:

Firstly, it will offer a description of the views of the respondents (in terms of frequency, percentage, means and standard deviations) as one group. The purpose behind presenting the collected data in descriptive form (besides the other purposes of descriptive analysis) is to explore whether or not the research variables that resulted from interviews (which the theoretical framework is based on) are the only variables related to audit risk in an IT-based accounting environment in SA. This is due to the exploratory nature of the study. The findings of this stage are presented in Chapter Eight.

Secondly, in order to find out if the respondents' perceptions vary for some questions when based on a selected demographic factor, namely the size of the audit firm (small, medium, large), a broad range of statistical procedures, including one-way ANOVA tests, and paired comparisons according to Scheffe, Chi-square[11] tests were used as statistically appropriate. The results of this stage are showed in Chapter Eight.

Thirdly, the relationships between the variables of the study (as suggested by the research model) will be examined by means of Pearson's Correlations and Path Analysis. The findings of this stage are presented in Chapter Nine.

[11] It is worth mentioning at this point that this statistical test (i.e. Chi-square) was used only with the variables that were measured on a nominal scale ("yes or no" answers).

5.9 Conclusion

This chapter aimed to present the research methodology that has been adopted in conducting this study. The literature discussed in Chapters Three and Four led the author to conclude, to a certain extent, that such literature is vague. Accordingly, the grounded theory approach was employed to provide a basis for understanding the phenomena under scrutiny. Within this approach, and in the light of the study objectives, and the advantages and limitations of several research methods that could be utilised to collect the data of the study, a combination of personal interviews, followed by a mail questionnaire were found to be the most suitable methods of data collection for this research. It is hoped that the integration of the two strategies will provide an effective mechanism for combining the complementary advantages of the qualitative and the quantitative research approaches.

The next chapter will present the findings of the preliminary study (i.e. the interviews).

CHAPTER SIX

PRELIMINARY STUDY OF RELEVANT ISSUES

6.1 Introduction

The previous chapters, in particular three and four, highlighted the literature related to auditing in an IT-based accounting environment. Broadly speaking, it reviewed the impact of the advent of IT-based accounting systems on the auditing profession and the potential risks that are associated with such systems. However, the literature that covers this topic is sparse. In addition, this literature has been written by Western writers in the context of developed countries. Accordingly, and due to the short time since the adoption of IT-based accounting systems by the business sector in SA, it was felt that conducting a preliminary study, with the objective of collecting data which might provide insights into the experience of audit firms in SA with respect to the auditing of such systems, was vital. This study attempts to investigate the real practice (or reaction) of audit firms in SA as a result of this increased adoption of IT-based accounting systems and attempts to identify if there were any problems or obstacles associated with auditing such systems that might increase the level of audit risk. In addition, it might perhaps provide a basis for deriving the theoretical framework of the study (which will be discussed in detail in Chapter Seven). Therefore, the aim of this chapter is exploratory and descriptive in nature.

This chapter is organised as follows: following this introduction, the next section reports the findings of the interviews. The last section includes the chapter's conclusion.

6.2 The Findings of the Interviews

This section presents the data collected through the interviews. This presentation is divided into two subdivisions: firstly, the classification of respondents based on occupation and company size and secondly, the interviewee's opinions on the issues explored in the interviews.

6.2.1 Classification of Respondents based on Occupation and Experience

Occupation and experience are the only demographic variables that have been considered because of the exploratory nature of the preliminary study. The breakdowns of the participants based on these two variables are shown in Table 6.1 and Table 6.2.

Table 6.1 The Respondents' Frequency based on their Occupation

Occupation	Frequency	Percentage
Audit partner	1	6.7
Audit manager	7	46.6
Senior auditor	2	13.3
Internal audit manager	1	6.7
Auditor	4	26.7
Total number of respondents	**15**	**100**

Table 6.2 The Respondents' Frequency based on their Experience

Experience (years)	Frequency	Percentage
1 – 5	4	26.7
6 – 10	3	20
11 –15	2	13.3
16 – 20	4	26.7
21 - over	2	13.3
Total number of respondents	**15**	**100**

6.2.2 Reporting the Interviewees' Perceptions

The perceptions of interviewees described in this chapter will be reported under the following headings:

6.2.2.1 General Information about the Audit Firms and their Clients

Six questions were asked of interviewees in this part. In the first question, the representatives of the audit firms were asked to identify the size of their firms. The researcher was interested in exploring the size of the interviewees' firms since there is no formal classification for audit firms in Saudi Arabia[1] to help the researcher to make comparisons. Based on the participants' answers for this question[2], it was found that 26.7% of the sample were from large audit firms, while 60% came from medium-sized firms and 13.3% from small audit firms, as shown in Table 6.3.

Table 6.3 The Interviewees' Frequency Distribution by the Size of the Firm

Size	Frequency	Percentage
Large	4	26.7
Medium	9	60
Small	2	13.3
Total	**15**	**100**

When the interviewees were asked, in Questions Two and Three respectively, about the

[1] The researcher asked the Deputy Secretary General of SOCPA about the classification of audit firms in SA in terms of size and he said, "*This is confidential information and it is not allowed to be published or handed to researchers*".

[2] The researcher depended on the classification of respondents for their firms in terms of size. However, the researcher is aware that there are some techniques that can be used to identify the size of the firm (e.g. the number of employees) but such techniques were not considered suitable for use in these interviews since the interviewees would not wish to answer directly, considering this information confidential. Such techniques can be used, for example, in questionnaires since a respondent knows that nobody can trace from whom this information comes.

size and the main sector of their clients. It was found that the majority of the sample (nine) audited different-sized companies, while the minority of audit firms (one) audited small companies and five firms said that most of their clients were medium-sized companies. Moreover, the majority (nine) of the sample had clients from different business sectors (except banks). Only representatives from six audit firms (40%) pointed out that they audit commercial and governmental banks[3].

Participants were asked, in Question Four, to identify the approximate percentage of their clients who have IT-based accounting systems. Their responses are recorded in Table 6.4. As is apparent from the table, more than 61% of the clients of large audit firms use IT-based accounting systems, compared with more than 41% of the clients of medium audit firms. Surprisingly, more than 81% of the clients of small audit firms use IT-based accounting systems. These may be subjective figures but they do give an insight into the spread of IT-based accounting systems by the Saudi business sector.

Table 6.4 The Proportion of Clients of Audit Firms who Use IT-based Accounting Systems

Size of audit firm	**Percentage of clients**					**Total firms**
	0-20	***21-40***	***41-60***	***61-80***	***81-100***	
Large				2	2	**4**
Medium			3	2	4	**9**
Small					2	**2**
Total			**3**	**4**	**8**	**15**

In Question Five, participants were asked to identify the type of IT-based accounting systems that their clients use. The respondents indicated that the majority of their clients have simple (stand-alone) IT-based accounting systems and few of them have adopted

[3] Banks (especially commercial banks) have full IT-based accounting systems.

complex (fully integrated) IT-based accounting systems. Four participants out of the total sample (26.7%) stated that around 40% of their clients have fully-integrated IT-based accounting systems. However, some representatives of the audit firms indicated that there was an increased trend to adopt fully integrated accounting systems by their clients to eliminate the problems of stand-alone accounting systems such as those which deal with the recording of stocks. For example, an audit partner of a large audit firm stated his view by saying, "*We have clients who use two IT-based systems, one for financial accounting and one for stock and they are separated due to the poor understanding of IT of the client's management. However, there is an increased trend by clients to adopt fully integrated IT-based accounting systems to overcome the problems of stand-alone*". The main business sectors of their clients who use fully-integrated IT-based accounting systems were banking, manufacturing and construction.

When the interviewees were asked to explain the nature of the developments in their clients' IT-based accounting systems, they pointed out that the majority of their clients install new systems for many reasons, such as most of their accounting systems (i.e. accounting software) are out of date and cannot cope with the extension of their business or cannot be upgraded to fully integrated systems. In addition, the cost of installing a new system may be less in terms of cost than upgrading, especially if the client does not have programmers. In some cases, the provider of their software had left the market for one reason or another. A final reason given was to harness the advantages of recent developments in IT. Generally speaking, such software was ready-made. However, all interviewees indicated that if the IT-based accounting system has been especially tailored for a company, their clients usually did upgrade their systems because such systems or software were specific to the nature of the company. Moreover,

this was a means of keeping their investment in such facilities which had cost a good deal of money to develop.

6.2.2.2 Problems Associated with Clients' IT-based Accounting Environments

The aim of this part of the study is to expose the problems that are associated with clients' IT-based accounting environments in SA and also to know whether the problems are similar or different from those described in the Western literature. Finally, it seeks to address the best ways of reducing such problems.

In the first question to this part of the interviews, the interviewees were asked to describe any problems which faced them or their colleagues when they audited in an IT-based accounting environment. Most, if not all, participants suffer from the results of the unsuitability of their clients' accounting software. It was found that the accounting software adopted by their clients had many faults, such as inaccurate or poor programming (e.g. making wrong transfers), offering the minimum level of information (e.g. only an account balance and not a balance sheet), poor security (e.g. the possibility of changing registered data and the possibility of allowing unauthorised access), poor documentation and breakdowns in the software with the loss of some information. In addition, the accounting software is not appropriate to the nature of the client's business (particularly, ready-made accounting software) and, in turn, it is incapable of meeting the needs of the client. An audit manager of a medium firm answered this question by saying: "... *we found that some accounting software made wrong calculations ... or general ledgers are not identical with subsidiary ledgers due to some faults in the programming*". The senior auditor of another medium firm stated that: "...*a common problem that faces us is the unsuitability of the accounting software since some of them*

have imperfections in the programming and others are not convenient for the nature of the client's activity". Interviewees pointed out the reasons behind such a problem which included their clients' concentration on the cost rather than the quality of their accounting software since producing specific accounting software that is suitable for their businesses would cost them a lot more. In addition, they noted the lack of understanding of IT of some clients' management who do not have the ability to choose appropriate software for their businesses from the right provider. This was described by an audit manager from a medium-sized firm when he answered this question as follows: "*... the reason for the weakness of the clients' accounting software is that most clients do not care about quality but only the cost*". The audit manager of another medium firm stated that: "*... some software does not give final results such as a balance sheet, only an account balance. Because of the lack of understanding of IT of some clients' management, this leads to the adoption of inaccurate accounting software and/or the choice of an unsuitable computer company which does not understand the nature of the client's business ... for instance, I know of a ... company which has not issued its financial statements for two years because of faults in programming*".

The second problem that was mentioned by the participants regarding auditing in such an environment was the lack of competence of their clients' staff in dealing with IT-based accounting systems. In other words, they were not qualified to take advantage of such a system and, in some cases, they may make mistakes. The reason behind such a problem is a lack of education in IT of clients' staff. Accordingly, their background in IT was weak or even non-existent and they only started learning how to deal with such systems on their own through, or after, work. In addition to this reason, most clients did not seem to care about giving their staff courses to improve their knowledge and skills

in this area (i.e. the lack of a client's staff training in IT). Another reason behind such a problem was the cost since employing staff who are qualified in IT-based accounting systems or training them by sending them on courses in this field would be costly to the business. This issue (i.e. the lack of competence of a client's staff in dealing with IT-based accounting systems) was raised by most interviewees. For instance, an audit manager of a large audit firm answered this question by stating that: "... *we suffer from the lack of competence of some clients' staff who are not able to deal with such systems ... this situation will increase the occurrence of the errors and in turn it will increase audit risk. The main reason for clients not employing skilled people is cost*".

The third problem stated by participants was the weakness of clients' internal control systems in an IT-based accounting environment. This weakness included, for instance, the lack of segregation between duties, the possibility of access without a password, and the possibility of changing data by personnel, not only top management. For example, an audit manager of a large audit firm stated: "... *one of the problems in such an environment is the weakness of the control around the computer. This situation leads you to doubt the integrity of the figures that are yielded by such systems and this, in turn, forces you to increase the audit sample to make sure that these figures are true. Thus, this process affects the duration of the audit*". This issue was also confirmed by an audit partner of a large firm who stated that: "...*some accounting software does not have a password*". One of the reasons behind such a problem, as mentioned by participants, is the lack of understanding of IT of the clients' management since they are not aware of the nature of IT-based accounting environment. The other reason is the clients' financial cost concern since implementing tight internal control systems would be costly.

Since none of the participants referred directly to fraud during their answers to the previous question, they were asked in Question Two if the adoption of IT-based accounting systems contributed to a greater risk of fraud. Some interviewees pointed out that if IT-based accounting systems were run by skilled staff this would increase the opportunities for fraud. For instance, an audit manager of a medium firm supported his view by mentioning the following story: "*... during our auditing of a bank, we found that an employee had opened a fake bank account and had issued eight credit cards with the assistance of another employee. He then transferred one or two Riyals*[4] *from each account in the bank to his fake bank account for three years*". However, the majority argued that committing fraud in an IT-based accounting environment was dependent on two factors: firstly, the tightness of the internal controls, such as segregation between duties and level of authority, and secondly, the quality of the accounting software in terms of security. For example, there was a need for passwords for access and also a built-in inability to modify any past records. Only one participant claimed that the adoption of the IT-based accounting system reduced fraud due to the features of its technology.

In Question Three the researcher tried to investigate the state of accounting software in Saudi Arabia since all participants raised this issue. They were asked whether the accounting software that was used by their clients was reliable or not in terms of programming and output. On the one hand, some of the participants indicated that the accounting software that was run by their clients was reliable but incomplete. This means that its output was true but it did not cover the entire accounting cycle. For example, some accounting software does not produce balance sheets and some does not

[4] The Riyal is the Saudi unit of money (the exchange rate is US $ 1 =SR 3.75 on average).

calculate industrial cost. On the other hand, the majority of participants argued that Arabic accounting software was both unreliable and incomplete although there is some dispute among participants in terms of how inadequate such software is. Participants mentioned some factors that made Arabic accounting software especially questionable. Firstly, most, if not all, Arabic accounting software is translated from Western accounting software and this translation may not have been done precisely. Secondly, although Arabic accounting software is sometimes produced originally by Arabian computer companies (i.e. not translated), such software is designed mostly by people who are knowledgeable in computing while their knowledge in accounting is weak. In other words, there is a gap between computer experts and qualified accountants since such accounting software is often produced by small companies which do not have the financial ability to bring in qualified people in both areas. Thirdly, most providers of such software aim only to sell their products. They do not think or care about the after sale services, such as technical support or training their customers' staff. Thus, a lack of sufficient maintenance threatens the security of such software. Fourthly, the major proportion of such software is ready-made accounting software (also called shelf or multiple purpose accounting software). Such software can be applied in different business environments. However, the problem of such software is that most of it is not appropriate for the particular activity of the client and this, in turn, may cause many errors and problems. The reason that most businesses have for purchasing such software is the high cost of producing specific accounting software which is suitable for the activity of the client. Finally, most clients do not take out maintenance contracts for their accounting systems or software, even if such a service is made available by the providers. This was because of financial reasons but if any problem were to occur in such systems, this would not be solved or would be solved incompetently. It is worth

noting that many participants mentioned that some of their clients prefer to use Western accounting software to avoid such problems but, according to the regulations of the MOC and also the Department of Zakat and Income Tax[5] (DOZAI), all companies in SA must hold and publish their accounts in Arabic, otherwise the highest level of Zakat or tax will be imposed on their profit.

When interviewees were asked, in Question Four, about the problems that were involved in the examination of internal controls in an IT-based accounting environment, they pointed out many problems. The first problem related to the suitability of their clients' accounting software since such software may be weak in terms of documentation, security, and may risk the loss of information (backup). This problem has been discussed in detail above. The second problem is the weakness of internal controls in IT-based accounting systems, such as the lack of technical support to ensure secure maintenance or effective upgrading, the lack of a disaster cover plan, the lack of segregation between duties since one person (for example, may sell and also enter the data into the computer), authorisation of access, and modifying the records. Some interviewees clarified this issue by saying: "... *we found some accountants who cancel some transactions and enter them again ... in addition, the management of a company changed some transactions that we had audited in the past*". Another auditor of a small firm stated: "... *there is no level of authorisation where the accountants only enter the transaction and the cancellation or modification of such transactions are only carried out by their supervisors or top management*". The third problem was related to the lack of competence of the client's staff in dealing with IT-based accounting systems. For

[5] The government department that collects Zakat from domestic companies according to Islamic law and tax from foreign companies. It is like the Inland Revenue in the UK.

example, a senior auditor of a large firm exposed this issue by stating: "... *when we demand a detailed report, some of our clients' staff cannot get it for us because they are not skilled in dealing with such systems*". This problem has also been discussed above and therefore, there is no need to repeat it again. The last problem, mentioned by only one participant, was that of the difficulty of tracing some transactions. In the literature, this is called "the loss of the audit trail". He was an internal audit manager of a medium-sized firm and he clarified this problem by saying: "... *accountants enter data according to account codes and, in turn, I have difficulty as an auditor to make sure that entered data are distributed to related accounts and the financial statements are complete. Also, I cannot detect errors unless they are clear*".

Interviewees who did not mention "the loss of the audit trail" problem during their answers for the previous question, were asked about this in Question Five. The representatives of twelve audit firms (86%) indicated that the problem of the loss of the audit trail did not exist in IT-based accounting systems when they answered this question. For example, an audit manager of a medium-sized firm denied the existence of this problem because of developments in IT by saying: "... *this problem does not exist because of the developments in accounting software*". However, some participants argued that such a problem might appear if the auditor does not have sufficient IT skills which enable him/her to deal with such systems or if the accounting software is unsuitable. For instance, an audit manager of a medium-sized firm considered that: "... *this problem will not exist if the auditor is qualified* ". Another audit manager of a medium firm argued: "... *this problem will not exist unless the features of the accounting software are weak*". Only representatives of two audit firms (14%) stated that the problem of "the loss of the audit trail" exists.

Participants who pointed out the existence of "loss of the audit trail" were asked, in Question Six, to give details about the nature of such a problem. Based on their answers for this question, this problem appears if the IT-based accounting systems are complex or unsuitable (i.e. faulty software). For instance, an audit manager of a medium firm described this problem by saying: "*... if the system is complex, you cannot trace the transaction but it is easy to know whether the system is secure or not*". Another senior auditor of a medium-sized firm also expressed his concern by saying: "*... for example, some expense items appear in total and, if we need the details of such expenses from the programme, we cannot get them*".

The representatives of audit firms who claimed that the problem of "the loss of the audit trail" existed were asked, in Question Seven, to explain how their firms overcame such a problem. The methods used by their firms include dependence on the manual auditing of transactions, ensuring the existence of a valid voucher for each transaction, and examining the security of the system. The first[6] participant was an internal audit manager of a medium-sized firm; he answered this question by saying: "... *since we do not have generalised audit software which assists in the examination of the reliability of IT-based accounting systems, we have to audit transferred transactions manually, especially in networks which are mostly used for stocks where we have difficulty in tracing registered and transferred transactions due to a multiplicity of transactions and classifications*". The second person to mention it, was a senior auditor of a medium firm who answered this question by saying: "... *we have to do our examination through vouchers and we also demand that the client's accountants show us details of the*

[6] The number of participants who stated that this was a problem is three, as mentioned above.

transactions". The third participant answered this question as follows: "*... such a problem is overcome through examining the security of the system*".

The last question in this part focuses on possible ways of reducing the impact of the problems associated with auditing in an IT-based accounting environment. The interviewees gave some possible solutions for reducing the impact of these problems as follows: firstly, by producing reliable accounting software from known computer companies which covers all the data which is requested by both companies and auditors; also to provide technical support. In addition, such software has to avoid current problems, such as inaccurate programming, poor security, and the ability for records to be modified. Moreover, such software has to be appropriate for the activity of the business and this aim can be achieved through producing specific accounting software for the business and not purchasing what is called ready-made accounting software. Secondly, it is necessary to impose tight internal controls which include, for example, the segregation of duties, levels of authority, good security, and a disaster recovery plan. Thirdly, training or employing staff who are skilled in IT would reduce entry errors. Finally, only two participants answered this question taking into consideration the possibility of reducing the impact of such problems in terms of the audit risk. They pointed out that the impact of these problems could be reduced by stopping the use of the auditing around the computer approach and shifting to the auditing through the computer approach. In addition, increasing the competence of auditors in auditing IT-based accounting systems through training would have the effect of reducing risk.

6.2.2.3 The Saudi Audit Standard Related to the IT-based Accounting Environment

The aim of this part was to evaluate the "*Audit Standard in Organisations that Use the Computer*" issued by SOCPA in 1997, and also to know whether audit firms responded to this standard or not and, if not, why. In addition, it aims to investigate whether or not the audit environment in SA needs more standards and guidelines and finally, to discover if there is any relation between the audit standard related to the IT-based environment and audit risk.

In the first question in this part, interviewees were asked to mention the advantages and disadvantages of the "*Audit Standard in Organisations that Use the Computer*" that was issued by SOCPA in 1997 from their points of view. The researcher was shocked to find that around half (seven out of fifteen) of the representatives of the audit firms in SA answered this question by saying: "*I am not acquainted with it*" as is shown in Table 6.5. A senior auditor of a large audit firm answered this question by stating: "... *I have not seen it, and all Saudi standards are out of date ... we follow American and International standards which include Saudi standards and other standards*". His answer seems not to be realistic since the first standard in SA was issued in 1986, and the audit standard relating to auditing IT-based accounting systems was issued in 1997. Another auditor from a medium-sized audit firm answered this question by saying that: "... *I have not seen it because we did not take a course on it. The reason for this is that most business companies have simple IT-based accounting systems*". An audit manager of a medium-sized firm gave a strange reason for not being acquainted with this standard when he said "... *I have not seen it because it is not yet formulated in the final*

edition"! When the researcher informed him that the final formulation of this standard was published in 1997, he commented by saying, "*Do you have a copy of it?*"

Table 6.5 Participants' Response Frequency Regarding Acquaintance with the Saudi Audit Standard Issued by SOCPA in 1997 in an IT-based Accounting Environment			
Size of the audit firm	**The type of answer**		**Total**
	I am not acquainted with the standard	***I am acquainted with the standard***	
Large	1	3	4
Medium	4	5	9
Small	2		2
Total	**7**	**8**	**15**
Percentage	**46.7**	**53.3**	**100**

Those who were acquainted with this standard criticised it by saying that it is not practical since only a few audit firms could apply it for the following reasons: firstly, the application of this standard was expensive, as stated by two representatives of audit firms. Secondly, the standard is sophisticated compared with the level of application of IT in the accounting environment in SA. It was merely a translation of American or International standards in this field and it is therefore not appropriate for a Saudi IT-based accounting environment since America was a developed country and SA is a developing one. Thirdly, most staff of audit firms in SA cannot cope with it because their skills in auditing IT-based accounting systems are insufficient. Finally, SOCPA could be accused of being unrealistic because they issued the standard but they did not run any programme or courses to help auditors apply such a standard in practice. An auditor from a large audit firm answered this question by saying: "... *this standard is good in theory but it cannot be applied in practice because its practical application costs audit firms and audit fees in the market are low. From my point of view, the*

proportion of audit firms that can apply this standard is around 20%". An internal audit manager of a medium firm answered this question by stating that: "... *this standard is a translation of the American standard. It is a good standard but it is not appropriate for the Saudi environment since audit firms in SA do not have the ability, in terms of facilities, to apply it satisfactorily*". An audit manager of a large firm tried to evaluate the standard by saying: "... *in general, this standard does not differ from international standards. Its advantage is that it helps auditors by giving them guidance on the procedures that should be followed in auditing IT-based accounting systems. However, the disadvantage of this standard is that not all auditors can understand it and apply it*". An auditor from a medium-sized firm focused on training when he answered this question: "... *the standard is good but we have to have some training in order to be able to deal with it... or at least this standard should be formulated in a clearer way*". An audit manager of another medium firm gave a comprehensive answer to this question by saying: "... *the standard is good but its application is difficult because SOCPA issued the standard and did not offer any training programmes to help auditors apply it in practice. In addition, not all audit firms are qualified in terms of staff and their financial ability to audit IT-based accounting systems because the audit of such systems is costly. The reason for this flop is that the organisation of the audit profession in SA is new (around 15 years old). The profession is in its infancy and some firms have not adhered to the standards in general and those related to the IT-based accounting environment in particular. The reason behind this might be the environment in which such standards are applied since there are some audit firms which resist these standards; also, some clients do not help audit firms in following certain standards*".

Only the representatives of the eight audit firms (53.3 %) who said that they were

acquainted with the audit standard related to IT-based accounting systems were asked, in Question Two, if they had made any changes in their policies as result of its issue. Two out of the seven[7] claimed that they had made changes in their policies as a result of the issue of the "*Audit Standard in Organisations that Use the Computer*". However, when they were asked to explain the nature of this change in Question Three, their answers did not indicate that they had made fundamental changes. One of them (an audit manager of a medium-sized audit firm) answered this question by stating that: "*...there was no basis before the issue of this standard and so everyone audits such systems according to his experience that he brought from his country*". It appears from such an answer that his audit firm did not change its policy at all. The other response came from the internal audit manager of a medium sized firm who explained the change in the policy of his audit firm as follows: "... *we have to follow the instructions of the standard to protect ourselves from blame or ultimately being closed down*".

Since the representatives of five audit firms out of seven pointed out that they did not make any changes in their policy as a result of the issue of the Saudi audit standard when they answered Question Two, they were asked to explain the reasons for not changing their polices in Question Four. The vast majority of them answered this question by claiming that they followed American and/or International standards when auditing IT-based accounting systems. An auditor from a large firm justified the reaction of his firm to the Saudi standard by saying: "... *since 1987 our firm has followed International standards and Saudi standards are similar to International standards*". Similarly, an audit partner of another large audit firm stated: "... *the Saudi*

[7] One representative of an audit firm has been excluded because he refused to answer this question by saying, "*I cannot comment on this question since such information is confidential*".

standard does not differ from International and American standards ... it is just a translation". This justification has been supported by another audit manager from a large firm who answered this question by saying that: "*... we apply the American and International standard which existed before the issuing of the Saudi standard and they embody the auditing of IT-based accounting systems*". This view was also put forward by the audit manager of a medium-sized firm who stated that: "*... we have followed American and International standards since we established our firm in 1981, so we anticipated SOCPA in this field*".

The interviewees were asked if the IT-based accounting environment in SA needed more audit standards and guidelines and if so, they were asked to explain their reasons in Questions Five and Six respectively. There was consensus among them that auditing in the Saudi IT-based accounting environment did not need more standards and guidelines at the present time. Instead, the representatives of the audit firms stated that the IT-based accounting environment needs more awareness on the part of audit firms and clients, more training for auditors on how they can apply this standard in practice, and means of forcing audit firms to follow the existing standards. For instance, an audit manager of a medium-sized audit firm answered this question by stating that: "*... we need further training and education more than we need the issue of extra standards for auditing in an IT-based accounting environment. Thus, some training courses must be organised to consider the practical side of auditing such systems*". An auditor from a medium-sized firm answered this question by saying: "*... the problem here is the low awareness of clients and audit firms in this environment*". Another audit manager of a medium firm focused on the necessity for such a standard to be tailored to the Saudi environment by saying: "*...I do not think that we need more standards at the present*

time. However, we need our auditing standards in this field to be appropriate to our environment ... and, at the same time, there should be training for auditors and attempts to adapt the standards to the needs of our audit environment ... also we should not depend on other standards". An auditor from a large firm explained that it was unnecessary to issue more standards by saying: "*... we do not need more standards at the present time because IT-based accounting systems have not been developed in a way that require more standards*".

Participants were asked in the final two questions if there is a relationship between the standard which relates to the IT-based accounting environment and audit risk, and also to explain such a relationship if it exists. All representatives of the audit firms emphasised that there was a relationship between audit standards in the IT-based accounting environment and audit risk. In a wider sense, they indicated that the existence of useful standards which could be applied in practice, are understandable to auditors, and which are appropriate to the environment where they would be applied, would reduce audit risk. For example, an audit manager of a large firm answered these questions by stating: "*...the more audit standards in an IT-based accounting environment are comprehensive, clear, and clarify what should be done in this environment, the less the audit risk*". Similarly, an auditor from another large firm answered these two questions by saying: "*... of course there is a relationship. The existence of audit standards that persuade audit firms to follow the proper procedures in auditing such systems will reduce audit risk*". The audit manager of a medium firm pointed out that such standards should be practicable when he answered these questions: "*... yes, there is a relationship. If the audit firm does not have the facilities to apply the standard in practice, this will lead to increases in audit risk. For instance, SOCPA*

should train auditors and put on courses to show them the mechanism of the application of such a standard".

6.2.2.4 The Audit Approach or Technique in an IT-based Accounting Environment

The aim of asking interviewees about their audit approach was to investigate the techniques that were used by audit firms to audit IT-based accounting systems and in addition, to explore if they have made any changes in their audit approaches as a result of the adoption IT-based accounting systems by their clients. Moreover, the question seeks to discover if their audit manuals include any specific approaches for auditing such systems and to investigate if they use CAATs in their audit work. Finally, it obtains participants' feelings regarding the relationship between the type of audit approach used in this environment and audit risk. Twelve questions were asked to enable interviewees to explore such issues.

In the first question in this section the participants were asked to identify their audit approach. The representatives of twelve (80%) audit firms pointed out that they use a system-based approach, compared with only three (20%) audit firms which indicated that they use the risk-based approach, as shown in Table 6.6. It is worth mentioning that two-thirds of audit firms which used a risk-based approach are large firms. Since none mentioned a high-level risk audit approach, described in the literature as the fourth generation of audit, the interviewees were asked whether such an approach was used by them at all. It appears from their answers that such an approach is unknown to them, especially in the case of small and medium-sized audit firms. However, the representatives of large firms indicated that such an approach is not widely used in their work. For instance, a senior auditor of large audit firm said: "*We use this approach only*

at the beginning of the engagement". Another audit manager of a large firm answered this question by saying " A *high-level risk approach is not central to our work*".

Table 6.6 The Respondents' Frequency based on the Audit Approach					
Type of audit approach	**Size of audit firm**			**Total**	**Percentage**
	Small	***Medium***	***Large***		
Substantive approach					
System-based approach	2	8	2	12	80
Risk-based approach		1	2	3	20
High level risk approach					
Total	**2**	**9**	**4**	**15**	**100**

When interviewees were asked, in Question Two, if the adoption of IT-based accounting systems had caused any changes in their audit approach, eighty percent of the sample (twelve audit firms) admitted that it had, compared with twenty percent (three audit firms) who had made no changes to their audit approach.

The representatives of audit firms who claimed that their audit approaches had changed due to the adoption of IT-based accounting systems were asked, in Question Three, to explain such change. It was found that there are some differences between audit firms regarding the changes that they had made in their audit approach. This change in the audit approach of audit firms in such an environment can be divided into two types, as follows: firstly, audit firms whose audit approaches require them to examine the reliability of the processing which goes on inside IT-based accounting systems. A senior auditor of a large audit firm described the change in the audit approach of his firm by stating: "... *the adoption of IT-based accounting systems by clients has converted auditing from auditing people to auditing systems and the strength of internal controls inside and around such systems*". Similarly, the audit manager of a medium-sized firm

described such changes by saying: *"... if you go to audit a bank which has millions of transactions it would be more effective to ensure the reliability of its system rather than examining a sample of its transactions*". Secondly, some audit firms change their approaches only by comparing input with output after ensuring the validity of vouchers. Trust in the reliability of such systems was stated by some participants as the reason for their firms using such a technique. For instance, the auditor from a small firm described this technique by saying: " ... *if the input is true, the output will be true as well, so you should focus on the validity of input*". However, this would appear to overlook the possibility a processing error or fraud.

The interviewees who stated that their audit firms did not make any change in their audit approaches, despite the increased adoption of IT-based accounting systems by clients, did not mention typical reasons except the audit manager of a medium-sized firm who justified his comment by saying: "... *I do not have the facilities to audit inside such systems because they are expensive compared with audit fees in the market. Instead, I depend on the evaluation of internal controls and printouts of general ledgers and then audit them manually*".

Questions Four, Five, and Six focused on the audit manual. The representatives of the audit firms were asked, firstly, if their firms had an audit manual, and whether or not it embodied a method for auditing IT-based accounting systems. In addition, they were asked, if their firm did not have audit manual, why this was so. The interviews revealed that two out of fifteen participants did not have audit manuals. Those who indicated that they did not have manuals were from small and medium firms in terms of size. They justified not having audit manuals as follows: The representative of the small audit firm

stated that "... *we make an arrangement with the client and then prepare the audit work and the main points which the client concentrates on is the validity of cash, bank, account payable, and account receivable*". This is not really a valid justification, since it would seem that they carry out their audit work according to the desire of their clients and not the requirements of audit standards. The representative of the medium audit firm explained their situation by stating "... *we have guidelines and we also have recourse to the audit manuals of some large audit firms which include audit methods for both manual and computerised accounting systems*". Thirteen of the interviewees pointed out that they had an audit manual. However, five of those who stated that they did have a manual indicated that their audit manuals do not contain any particular method for auditing IT-based accounting systems. In addition, three of those who stated that they had an audit manual pointed out that the part which was related to IT-based accounting systems was in the preparatory stage. Furthermore, the researcher was shocked by the response of the representative (an audit manager) of a large audit firm when the researcher asked if the audit manual of his firm contained a particular method for auditing IT-based accounting system. His answer was: "... *we have an audit manual on CD but I do not know if it includes a particular method for auditing IT-based accounting systems*". Thus, it can be concluded that those audit firms whose audit manuals include a particular method for auditing IT-based accounting systems number only four (26.7%), as illustrated in Table 6.7.

Table 6.7 The Respondents' Frequency Distribution According to the Audit Manual

Size of audit firm	Firms which do not have an audit manual	Firms have audit manual				Total
		It does not include a specific method for IT systems	*The part which is related to IT-based systems is not yet finished*	*It includes a particular method for auditing IT-based accounting systems*	*Not sure*	
Large				3	1	4
Medium	1	4	3	1		9
Small	1	1				2
Total	**2**	**5**	**3**	**4**	**1**	**15**
Percentage	**13.3**	**33.3**	**20**	**26.7**	**6.7**	**100**

The seventh question in this part related to the reliability of internal controls in IT-based accounting systems. The representatives of the audit firms were asked to explain the methods used by their firms to examine the reliability of internal controls in IT-based accounting systems. The answers of the interviewees for this question can be split into two groups, as shown in Table 6.8. The first group pointed out that they depend on the output of IT-based accounting systems when they examine the reliability of internal controls in such systems; this group represents 60% (nine audit firms) of the sample. One auditor from this group stated that: "... *we examine the output and not the system, and there is no difference between manual accounting systems and IT-based accounting systems since in both of them there must be an entry and a voucher*". Another auditor said: "... *we depend on the output of the IT-based accounting systems because we are interested in detecting the differences in the voucher cycle whether the accounting system is manual or IT-based. This is because companies which adopted IT-based accounting systems are still using documents and using the computer includes only the*

financial and not the accounting cycle". All the audit firms in this group are medium and small in terms of size. The other group pointed out that they examine the system itself by using computer-assisted audit techniques (CAATs) in order to ensure the reliability of internal controls in IT-based accounting systems. Such an examination could be carried out by one of their staff or by consulting an IT specialist. For instance, a senior auditor of a large audit firm stated that the complexity of the system defines the method of examining in such an environment: "*...If the IT-based accounting system is complex we have recourse to a Technology Risk Consultant*". An auditor from a large audit firm answered this question by saying: "... *we use audit software but I do not know its name*". An audit partner in a large audit firm stated that they used dummy data as a method for examining the reliability of such systems when he answered this question: "... *we examine internal controls in such systems by entering dummy data to ensure the reliability of its output compared with input*". This group represents 40% (six audit firms) of the sample, where four are large firms, one medium and one small. However, the crucial points that the researcher noticed from most of the responses from those participants who stated that their firms examine the reliability of internal controls in IT-based accounting systems using CAATs were as follows: firstly, their audit firms use CAATs only at the beginning of the engagement or whenever the system has been changed or developed. This examination is not carried out continuously. Secondly, such an examination of the reliability of internal controls in IT-based accounting systems using CAATs could be conducted by a non-specialist especially with small and medium-sized audit firms.

Table 6.8 The Frequency of the Audit Approach Used by Audit Firms to Examine the Reliability of Internal Controls in IT-based Accounting Systems

Size of audit firm	Type of audit approach		Total
	CAATs	*Output of the system*	
Large	4		4
Medium	1	8	9
Small	1	1	2
Total	**6**	**9**	**15**
Percentage	**40**	**60**	**100**

The eighth and ninth questions in this part are related to the previous question since interviewees who stated that their audit firms did not use CAATs were asked if they are familiar with such a term (i.e. CAATs). In addition, they were asked what reasons prevent them from using such a technique. The responses of the interviewees when asked about the term "CAATs" are illustrated in Table 6.9. As can be seen from the table, all representatives of audit firms (nine participants) stated that they had heard of CAATs and knew its meaning. The reasons that were offered for not using CAATs were as follows: The first reason was the lack of competent auditors in auditing IT-based accounting systems. Representatives of audit firms pointed out that their firms did not have skilled staff who could implement such a technique. As can be seen from Table 6.8, most of the audit firms which did not use such a technique are small and medium firms. The other reason, as was mentioned by some participants, was the lack of a appropriate audit standard that guides them in implementing such a technique. They claimed that the standard that was issued by SOCPA in 1997 was not comprehensible to the auditors and also it did not include any procedures which explained the application of such a technique within the IT-based accounting environment in SA.

Table 6.9 Participants' Response Frequency about their Familiarity with the Term CAATs					
Responses	**Size of audit firm**			**Total**	**Percentage**
	Small	***Medium***	***Large***		
I have not heard about it					
I have heard about it but I do not know what it means					
I have heard about it and I know what it means but I do not use it.	1	8		9	100
Total	**1**	**8**		**9**	**100**

In the tenth question in this section, participants were asked about the sufficiency of printouts in evaluating the reliability of internal controls in IT-based accounting systems and the issuing of audit reports based on the printouts from such systems. Most interviewees agreed on the sufficiency of a printout but they made some exceptions, as follows: on one hand, some interviewees pointed out that a printout of accounting records in this environment is sufficient but only after an examination of entries and their vouchers. In a wider sense, they presume such systems are reliable and focus on the mistakes that may occur during the process of entry; they also ensure that each entry has a voucher. For example, an audit manager of a medium-sized audit firm answered this question by saying: "*Yes, it is enough, but after making sure that vouchers are valid, and inputs appear in outputs*". This method is called "auditing around the computer". On the other hand, some interviewees indicated that a printout from IT-based accounting systems is insufficient without examining the reliability of the processing which goes on inside such systems. This method is described in the literature as "auditing through the computer".

In the last two questions in this part, interviewees were asked if, in their view, there was a relationship between the type of audit approach (i.e. comparing input with output or CAATs) used to examine the reliability of internal controls in IT-based accounting systems and audit risk. In addition, if this is the case, they were asked to explain such a relationship. The interviews revealed that fourteen out of the total sample (i.e. 93.3%) believed that applying unsuitable audit approaches for IT-based accounting systems would increase audit risk in such an environment. However, there were differences among them regarding the most suitable approach. On the one hand, some interviewees pointed out that relying just on a printout of accounting records without comparing input with output would increase audit risk. On the other hand, the majority of participants stated that if the audit approach does not include an examination of the reliability of the processing which goes on inside IT-based accounting systems using CAATs, audit risk would be greater than with manual systems, especially if the IT-based accounting systems were complex. An audit manager of a middle-sized firm stated: "... *if the auditor follows an audit approach that ignores the complexity of the systems and he depends completely on such an audit approach without verifying the reliability of such systems, the auditor may depend on misstated data. Thus, in order to reduce audit risk in such an environment, the audit approach must include an examination of the processing which goes on inside the systems by an IT specialist*". Similarly, an audit manager in a large audit firm stated: "... *of course there is a relationship between the audit approach and the level of audit risk. If there were no IT specialists, the system was poor and the control weak, the level of audit risk would increase*".

6.2.2.5 The Ability and Experience of Auditors in an IT-based Accounting Environment

The aim of this section is to investigate the skills that are required by audit firms for auditors who audit IT-based accounting systems and also to know if they have received any training to improve their knowledge in auditing such systems. Moreover, it aims to discover if audit firms have any IT specialists, to know when audit firms have recourse to such specialists, and to reveal if the adoption of IT-based accounting systems has affected the auditor's ability to audit such systems. In addition it seeks to explore the reasons behind the lack of competence of some auditors in auditing IT-based accounting systems and, finally, to discover whether there is any relationship between the auditor's ability in auditing IT-based accounting systems and audit risk.

Most interviewees agreed that the adoption of IT-based accounting systems has changed the skills that are required of auditors. So, in Question Two they were asked to explain this change in the skills required of auditors. The vast majority of the representatives of the audit firms answered this question by stating that auditors should be more educated in IT in order to be able to deal with IT-based accounting systems. An audit manager of a large firm expressed this point by saying: "... the *auditor must familiarise himself with computers by taking training in different aspects of IT in order to increase his knowledge in auditing IT-based accounting systems*". Similarly, an audit manager from a medium-sized audit firm supported this by stating: "... *the importance of auditors being educated and knowledgeable in IT has increased ... since this will affect their ability in auditing organisations that prepare their financial statements using IT-based accounting systems*". A minority of interviewees pointed out that auditors in an IT-based accounting environment should have English language skills since some clients

use English accounting software. This issue was mentioned by an audit manager in a medium-sized firm who stated that: "*... some clients use English accounting software which means the auditor must have expertise in the English language in order to audit such software ... also, auditors must understand the order of transactions in IT-based accounting systems in order to be able to detect any fraud*". However, two of the representatives of small firms claimed that an auditor's skills have decreased since the adoption of IT-based accounting systems. One of them answered this question by saying: "*... the skills of the auditor have decreased since accounting data has been recorded by the computer. The skills of naming, understanding and dealing with such data are fewer when compared with the skills needed for handling manual systems*". Another respondent answered this question by stating: "*...creativity in auditing no longer exists because IT-based accounting systems have made auditing easier. It is unnecessary for the auditor to be knowledgeable about computers to audit such systems but the most important thing is that an auditor should be sure that the entry of all data is accurate; the auditor should not be examining the system*!" These interviewees failed in their answers to pay attention to the risks of IT-based accounting systems which require auditors in such an environment to be more skilled. In other words, auditors are still required to be skilled but the type of skills may be different from those needed for manual systems.

To investigate the extent of the knowledge in IT required by audit firms in SA for auditors who audit financial statements prepared by IT-based accounting systems was the aim of the Question Three. Most representatives of the audit firms answered this question by saying that their firms require a basic knowledge in IT. It seems that audit firms require basic knowledge in dealing with the IT-based accounting systems

themselves and not in auditing such systems. However, there is a difference of opinion among audit firms when they argued that only a basic knowledge in IT was needed for auditors who audit IT-based accounting systems. On the one hand, large audit firms justified their need for only basic knowledge because of the existence of IT specialists within the audit team. A senior auditor of a large firm answered this question by stating that: "*We request basic knowledge for auditors who audit in this environment since they depend on IT specialists in examining the system*". Similarly, an audit manager of another large firm mentioned the same reason when he answered this question: "*Since we have IT specialists within our audit team, we request only basic knowledge in IT for our auditors*". However, the vast majority of medium and small audit firms justified their need for only a basic knowledge in IT for their auditors by mentioning the following reasons. Firstly, some representatives of small and medium audit firms said this was because of the type of audit method that they followed which is auditing around the computer. An audit manager of a medium-sized audit firm stated: "... *the auditor should be able to deal with computers and also, he should have an acceptable level of knowledge which will help him to apply audit standards and techniques as far as possible which will at least enable him to audit around the computer*". Another audit manager of a medium firm supported this view when he answered this question by saying: "... *the auditor need not necessarily be qualified in computers since the procedures in terms of auditing a voucher cycle are similar whether the accounting system is IT or manual. Computers are a way of recording accounting entries and logging information*". Secondly, the fact that many firms were satisfied with a basic knowledge in IT was justified by some participants by the high cost of employing highly qualified auditors in IT. This idea was expressed by a senior auditor of a medium-sized firm as follows: "... *we request basic knowledge in IT for our auditors*

since the employment of a skilled auditor in IT would cause a financial burden that cannot be afforded by our firm". Finally, one participant justified the need of his firm for only a basic knowledge of IT for the auditor by explaining that some clients refused to allow auditors to take information from their IT-based accounting systems by themselves. He was an audit manager of a medium-sized firm and he stated: "... *we request a general knowledge of computers where the auditor understands the logic of transactions inside the computer. However, there is no company that will allow you to take the data by yourself. You can only have a printout of data and then compare it with the account balance*".

The interviewees were asked in Question Four if they received any training to improve their knowledge of auditing IT-based accounting systems. Ten participants out of fifteen (66.7%) pointed out that they did not have any training to improve their audit skills in the IT-based accounting environment. An audit manager of a medium-sized audit firm justified this by the high cost of training courses which are run by SOCPA: "... *no, we have not taken any courses in auditing IT-based accounting systems because of the high cost of training courses which are conducted by SOCPA. For instance, SOCPA asked each auditor to take 180 points (not in auditing IT-based accounting systems but in general courses) while audit partners must take 300 points within three years; each 21 points cost 700 Saudi Riyals (SR). So, if you have ten auditors they will cost you around 63000 SR and we cannot afford this amount compared with our annual income. Thus, the audit partner refuses the training courses for the staff even if the firm is closed down and he says it is enough that I am attending such courses*".

The representatives of the audit firms who stated that they had undertaken some training to improve their skills in auditing IT-based accounting systems were asked to describe such training in Question Five. Only four (two large audit firms and two medium ones) out of five attended or conducted training courses related to the audit of IT-based accounting systems. An audit manager from a large firm responded to this question by stating: "*Yes, I have attended many courses in this field. For example, we attended a course on a program called "micro start" that helps auditors to take samples of IT-based accounting programmes*". An audit manager of a medium-sized firm answered the same question by saying: "*We do internal and external training for our staff, including how they can deal with computers and also how they audit around the computer. However, there are few auditors who can examine and take samples of the client's IT-based accounting system*". It is worth mentioning that the reason behind excluding the answer of one participant from the total five was because the course that he attended was related to audit automation[8] and not to auditing IT-based accounting systems. He was an audit partner in a large firm and answered the question as follows: "*... I attended a session in Egypt for senior auditors. The session explains how auditors can organise an auditing plan by using the computer. Thus, it was not focused on auditing IT-based accounting systems*". It can be concluded, therefore, that the total number who attended courses to improve their skills in auditing IT-based accounting systems was four out of the total sample (only 26.7 %), as shown in Table 6.10.

[8] For more details about the concept of "audit automation", please see Subsection 2.6.3.

Table 6.10 Participants' Response Frequency Regarding Attending or Conducting any Training Sessions Related to Auditing IT-based Accounting Systems			
Size of audit firm	**Type of answer**		**Total**
	We attended or conducted a training session related to auditing IT-based accounting systems	***We did not attend or conduct any training sessions related to auditing IT-based accounting systems***	
Large	2	2	**4**
Medium	2	7	**9**
Small		2	**2**
Total	**4**	**11**	**15**
Percentage	**26.7**	**73.3**	**100**

Also, the representatives of the audit firms who stated that they had taken some training were asked (in Questions Six, Seven, and Eight respectively) to explain the methods used by their firms to qualify their staff in the IT-based accounting environment, also whether such methods met with their audit requirements, and finally whether such methods were carried out in a logical and useful manner. The methods used by audit firms to qualify their staff who audit IT-based accounting systems include training sessions conducted by the audit firm itself and training outside the audit firm by contracting with a company to train their staff. The representative (an audit manager) of an audit firm answered this question, saying: "... *mainly we do our training inside our own firm using auditors from our firm and infrequently outside the firm*". An auditor of a large audit firm mentioned the methods used by his firm as follows: "... *we use training sessions inside the firm, and sometimes outside the firm, by contracting with specialists in this area*". The representative (an audit manager) of this large firm answered this question by saying: "... *we attend training sessions conducted in Bahrain and not by SOCPA*".

When asked, in Question Seven, if the methods used by their firms fulfil their requirements in the IT-based accounting environment, the majority thought such methods met their requirements entirely but a minority felt that such methods only partly met with their requirements. However, all of them stated that those methods which were used by their firms to qualify them in auditing IT-based accounting systems were carried out in a logical and useful manner when they answered Question Eight.

The representatives of the audit firms who pointed out that they did not partake in any training to improve their knowledge and skills in auditing IT-based accounting systems were asked, in Question Nine, how they dealt with such systems. The representatives argued that their staff could deal with IT-based accounting systems without training because of the existence of one or more of the following reasons. Firstly, they mentioned the existence of IT specialists within the audit team where auditors can depend on them in this area. This view was mentioned by an audit manager of a medium-sized firm who stated that: "... *in general, it depends on the experience of the audit manager in examining and evaluating the gravity of IT-based accounting systems with the help of the specialist*". Similarly, a senior auditor of a large firm stated: "... *we depend on the specialists in examining IT-based accounting systems*". However, it is worth highlighting that the IT specialists work as assistants to auditors at specific stages; they do not complete the whole task. Thus, the existence of an IT specialist within an audit team, in this researcher's view, does not eliminate the need for the auditor to be skilled in IT. More discussion regarding this issue will be presented in Question Thirteen in this part. Secondly, training can be covered through personal effort where the auditor improves his knowledge and skills by himself in his own time through self study. This method was mentioned by an audit manager from a medium-sized firm

who answered this question by saying: "*... everyone is solicitous to improve his personal level and teach himself by self study*". Thirdly, some participants indicated that their firms dealt with IT-based accounting systems through auditing around the computer. This answer was provided by the internal audit manager of a medium-sized firm who stated that: "*... we take accounting data from IT-based accounting systems and then we carry out auditing procedures and follow entries and outcomes in a form which enables us to judge the accounting programme*". Finally, a few participants claimed that they had no difficulty with auditing IT-based accounting systems since most of their clients' systems were simple. This view was expressed by an auditor from a medium-sized firm who answered this question by saying: "*... most organisations have simple accounting systems and they use computers only in their financial operations*".

Since some participants mentioned IT specialists through their answers for the previous question, the researcher tried to examine this issue in more detail by asking the representatives of the audit firms if their firms employed IT specialists and if so, how many IT specialists they employed. Also they were asked when they had recourse to these specialists in Questions Ten, Eleven, and Twelve respectively. Eight out of the total sample (53.3 %) indicated that they did not have IT specialists within their audit teams, as shown in Table 6.11. However, two of the eight pointed out that they had recourse to external computer companies only if their clients asked them to evaluate their IT-based accounting systems or to design IT-based accounting systems for them. In other words, they contacted external IT specialists to evaluate their clients' IT-based accounting systems, not as a part of their auditing procedures in such an environment but as a consultative service.

Only seven out of fifteen (46.7 %) indicated that they employed IT specialists in their audit firms. Three out of those seven pointed out that they have only one IT specialist within their audit team. However, one representative of a medium-sized firm said that his firm has four IT specialists; one of these is a senior and three work for him as auxiliaries. Another representative of a large firm of those seven stated that his firm has three IT specialists, one of these being a senior and two being auxiliaries. The vast majority of the representatives of the audit firms indicated that they went to IT specialists in the case of a new client or if the client's system was changed. An audit manager from a large firm stated that: "... *since we do not have enough IT specialists (only three: one senior and two auxiliaries), every audit manager suggests that some of his clients are examined by an IT specialist each year. However, if the system of a client was examined this year, it will not be re-examined next year unless the system was changed. It is worth mentioning that such an examination is carried out for big clients but for those clients who have only one PC, no examinations are carried out*". Similarly, an auditor in a large firm said: "... *our firm has only one IT specialist and we go to him in the case of a new client or when the system is changed*". An audit manager from a medium-sized audit firm answered this question as follows "... *we have four IT specialists (one is a senior and three are auxiliaries) and we approach them mainly at the first visit. However, if the client asks us to evaluate his IT-based accounting systems we co-operate with a computer company in this field*". However, only one representative from a small firm pointed out that his firm went to an IT specialist in the case of detecting errors in the programme. He was an auditor and stated: "... *at present, our firm has only one IT specialist ... we go to him only if there is an error in the client's programme. However, we do not examine the IT-based accounting system of the client in the first place because we assume that the system is sound until we find*

mistakes". The crucial question here is how mistakes will be found if the system is not examined until mistakes occur.

Table 6.11 Participants' Response Frequency Regarding the Employment of IT Specialists within the Audit Team

Size of audit firm	Type of answer		Total
	We have IT specialists	*We do not have IT specialists*	
Large	3	1	**4**
Medium	3	6	**9**
Small	1	1	**2**
Total	**7**	**8**	**15**
Percentage	**46.7**	**53.3**	**100**

The interviewees were asked, in Questions Thirteen and Fourteen respectively, if the existence of IT specialists within the audit team eliminates the need for an auditor to be qualified in IT and if so, how the auditor can judge that the examination by the IT specialists is sufficient. The vast majority of the representatives of the audit firms stated that the existence of IT specialists within the audit team assists the auditor in this environment but does not eliminate the need for the auditor to be skilled in IT. An auditor from a medium-sized audit firm stated: "*No, it does not ... auditors should improve their skills in IT because of the increased adoption of IT-based accounting systems. Ten years ago the number of companies that used computers in their accounting systems was very few*". Another auditor from a medium-sized firm answered the same question by stating: "*No, the auditor should be familiar with such systems because if the auditor depends on an IT specialist entirely, the specialist may deceive the auditor and, in turn, the risk will increase*".

Questions Fifteen and Sixteen examine the dependence of an external auditor in an IT-

based audit environment on the client's staff (either accountants or internal auditors) as a result of being unskilled in IT. The majority of participants pointed out that having to depend on the client's staff is rare because of their lack of competence and also because of the absence of internal auditors, except in large companies. They also stated that, even if internal auditors did exist, most of them are unqualified in IT. An audit manager from a large firm stated: "*... most companies do not have an internal auditor in strict terms and they are unqualified in IT ... the rest of clients' staff are usually accounts clerks*". An auditor from a medium firm said: "*... we do not depend on the client's staff, even if they are skilled in IT. However, in general, most clients' staff know only how to deal with such systems; they do not know the basic work of such systems and the procedures on which such systems are based*". However, it is worth mentioning that a minority of participants stated that they depend on their clients' staff but only after evaluating their competence. When they were asked if such a dependence might threaten the auditor's independence, they answered this question by stating that they benefited from them but did not depend on them. However, such an answer is only natural since, if they were to say anything else, they would condemn themselves. An auditor from a medium-sized firm stated that: "*We depend on them entirely since they, the client's staff, present all the data*". A senior auditor from a large firm, however, stated that: "*... we may depend on them but we have to be sure of their competence ... we do not depend on them entirely since we have our own methods*". A clear and comprehensive answer was given by an audit manager of another medium-sized firm when he answered: "*If the accounting software used by the client is ready-made, generally, the auditor will be familiar with it and he can deal with it easily since he has already seen it. However, if the accounting software that is used by the client is designed specifically for the client, the auditor needs to know its details from the*

designer of the software or from the client's staff and also whether the requested information exists or not. Regarding internal auditors, most of them are unqualified in IT".

The interviewees were asked, in Question Seventeen, if the adoption of IT-based accounting systems by clients had affected the auditor's ability to audit such systems. Their answers for this question can be divided to three categories, as follows: the first category of responses suggests that the audit process has become easier since the modification to IT-based accounting systems has enabled an auditor to get all the requested data in a shorter time and more easily. However, they argued that such a modification does not affect the ability of auditors because they audit around the computer which includes auditing entries and outcomes. In addition, most of their clients have simple IT-based accounting systems which do not require a skilled auditor in IT. For instance, an audit manager of a medium-sized firm stated: "... *IT-based accounting systems have eased the process of calling up data and making sure that they are accurate. This, in turn, cut time for us. This modification does not affect our work since we audit only outcomes*". The second category agreed with the first category that such a transference made the audit process easier and saved time and effort, especially if the system was fully integrated. However, they argued that the auditor cannot audit without the help of an IT specialist. In other words, the absence of an IT specialist would prevent the auditor from carrying out the audit process properly. For example, this view was asserted by a senior auditor in a large audit firm. He answered this question by saying: "*On one hand, the IT-based accounting system has made the audit process easier and faster, since such a system gives the auditor fast and detailed data, especially if the system is fully-integrated. However, on the other hand, an auditor*

cannot audit without an IT specialist. In other words, if an IT specialist is unavailable, the auditor can do nothing". The final category argued that the ability of the auditor in an IT-based accounting environment depends on the competence of the auditor in IT. In other words, if the auditor is skilled in IT he will be able to audit and it will be easier than auditing manual systems but if this is not the case, the auditor will be unable to audit properly in any case. For instance, an audit manager of a medium-sized firm said: "*... the ability of the auditor in such an environment depends on the competence of the auditor in IT*".

The interviewees were asked, in Question Eighteen, to explain the reasons for the lack of competence of auditors in auditing IT-based accounting systems. Most participants believe that the lack of IT training for auditors and lack of auditors' education in IT, since the curricula do not contain any courses related to IT or auditing in such an environment, are the main factors behind such lack of competence. An auditor from a large audit firm stated that "*... most auditors and audit managers do not have high or even acceptable knowledge in computing because of their education history, since the majority of them are more mature*".

In the final two questions in this section, the representatives of the audit firms were asked if any relationship exists between the auditor's ability to deal with IT-based accounting systems and audit risk. They were also asked to explain such a relationship. Most the participants stated that there is a relationship between the ability of the auditor in such an environment and audit risk. The representatives of the audit firms explained this relationship by stating that if the auditor is competent in IT, audit risk will be less, but if this is not the case, audit risk will be high. For instance, an audit manager of a

large audit firm answered this question by saying: "*Yes, there is a relationship. If the auditor is unskilled in IT, audit risk will be high. However, if the auditor is competent, this will reduce audit risk but will not eliminate it*".

6.2.2.6 The Financial Issues Related to Auditing in an IT-based Accounting Environment in SA

The aim of this part is to investigate whether financial constraints pushed audit firms to a specific audit approach or not and, in addition, to establish whether such financial constraints were the main reason behind certain deficiencies in the performance of some audit firms. Finally, this section aims to explore whether the shift to IT-based accounting systems has created new financial services for audit firms as it has created a new financial burden.

The interviewees were asked if financial constraints played an important role in deciding their audit approach in an IT-based accounting environment. Most representatives of the audit firms, especially those from small and medium sized firms, stated that the IT-based accounting system environment had created new requirements that cannot be afforded by their firms compared with their annual income. The participants argued that the increase in audit cost due to the shift to IT-based accounting systems, such as purchasing generalised audit software, training their staff in order for them to be able to deal with such systems, and employing IT specialists, was not off-set against the level of audit fees. Instead, some representatives of audit firms pointed out that some clients wanted their firms to reduce audit fees since IT-based accounting systems had made the audit process easier and faster than it had been with manual systems. For instance, an audit partner in a large firm focused on the level of audit fees

in the Saudi audit market when he answered this question: "*... the cost factor obstructs the development of the firm in this aspect because the level of audit fees in the audit market is not parallel with the requirements for auditing in an IT-based accounting environment*". The audit manager of a medium firm indicated that the availability of sufficient audit fees is a condition for effective auditing in such an environment: "*... when you have sufficient financial resources, this helps you to do proper auditing, such as carrying out expert examinations of the systems and purchasing generalised audit software. It also assists you to develop the firm in terms of training the auditors and employing skilled people*". An audit manager of a medium-sized audit firm indicated that cost is an important issue regarding the audit method when he answered this question: "*... there is no doubt that cost is one of the factors in deciding our audit approach in an IT-based accounting environment because I cannot buy or design audit software for examining the reliability of such systems like large audit firms can*". Finally, it is worth mentioning the answer of one audit manager of a medium audit firm (his firm examines its clients' IT-based accounting systems as a consultative service) since he referred to the demand of some of his clients to reduce audit fees. He remarked: "*... some clients ask us to evaluate their IT-based accounting systems and they consider this to be a part of our job since they refuse to pay more fees for this service ... our firm has auditors who have experience in giving basic evaluations of such systems but they cannot evaluate such systems technically because such work demands an IT specialist and we cannot place such a high burden of cost for so few customers. Some clients expect us to reduce audit fees since they argue that their adoption of IT-based accounting systems has made the audit process easier and faster ... in reality, their systems are weak and have many errors, thus, this demands more cost in terms of time and effort*".

The interviewees were asked, in Question Two, if it was necessary for their firms to expend more financial resources on training the audit staff who deal with IT-based accounting systems and also on purchasing (or designing) audit software to help auditors in such an environment. The vast majority of the representatives agreed that their firms should spend more financial resources on the training of auditors, except two participants who stated their case as follows. The first was a senior auditor in a large audit firm and he justified his disagreement by stating that he was satisfied with the amount of annual income which was set aside for training their staff in many aspects, one of which was IT. He answered this question by saying: "*... I do not think so, since our firm appropriated 10 % of its annual income for training and, in the last two years, our firm started to train auditors to deal with IT-based accounting systems in order to reduce the dependence on IT specialists. In general, our training budget is sufficient*". The other was an audit manager from a medium-sized firm and he justified his objection by saying: "*No, except when we have new clients*".

Regarding the purchasing (or designing) of audit software, the majority supported this action except three participants who stated their cases as follows. The first was an audit manager of a large audit firm and he justified his disagreement by mentioning the support that his firm enjoys from their foreign partner. He answered by saying: "*No, since our foreign partner already supports us with such audit software, we do not need to extend on this side*". The other was an auditor from a medium-sized firm and he justified his objection by pointing out the simplicity of their clients' IT-based accounting systems. He answered this question, saying: "*At present, no. This is because most of our clients' IT-based accounting systems are not complex since most of them are medium-sized companies. For instance, the only public limited company that our*

firm audits has just started using an IT-based accounting system and this is solely on the financial side". The last one justified his objection by stating that purchasing such software would create more cost. He answered this question, saying: "*No, because then we will need more time for following up and also more auditors which, in turn, will increase the cost*". It seems from his answer that he cares only about the profit of his firm, regardless of the quality of his work.

In the last question in this section, the representatives of the audit firms were asked if it was advantageous for the purposes of competition to have an audit team which is qualified to deal with IT-based accounting systems. The vast majority of the representatives of the audit firms (thirteen out of fifteen) confirmed that the existence of an audit team which was skilled in IT was advantageous for the purposes of competition since it increased the trust of the clients as such a team might save their business from massive losses in such an environment. It also increases the confidence of the users of the financial statement (e.g. shareholders). In addition, such a team may bring new financial resources, such as consultative services. For instance, an audit manager of a large audit firm answered this question by stating that: "... *yes, it is big advantage since the existence of such a team will differentiate your firm from others in many aspects. This is because the existence of such an audit team will give more value for customers in terms of computer systems and also security aspects. In addition, the availability of a skilled audit team in IT-based accounting systems will give more value to your audit firm in the eyes of users of financial statements and they, in turn, will trust your work since the existence of such a team will reduce audit risk*". Similarly, an audit partner in a large firm answered this question by saying: "... *the existence of such a team will increase your efficiency and, in turn, your ability to compete since it will give you a*

bigger proportion of the audit market. In addition, such a team increases the trust of the client because you may save his business from many pitfalls in this dangerous environment". However, two of the representatives of the audit firms pointed out that clients did not appreciate their arrangements in such an environment, such as creating a skilled audit team in IT-based accounting systems. For instance, an auditor from a large firm answered this question by saying: "*It is not an advantage since our clients do not ask for such a service but our firm qualifies auditors in IT just to protect ourselves*".

6.2.2.7 The Future of the Audit Profession in an IT-based Accounting Environment in Saudi Arabia

This part aims to predict the future of the audit profession in SA due to the increased adoption of IT-based accounting systems by different-sized businesses. In addition, it aims to explore the state of electronic commerce in SA and its impact on the audit profession. Finally, the participants were asked if the research had missed any points or if they wanted to add further information related to this research.

The interviewees were asked, in Question One, to predict the nature of changes in auditing as a result of the increasing adoption of IT-based accounting systems over the next five to ten years. The representatives of the audit firms predicted that the audit process would be easier and its quality better but its cost would be higher, especially in terms of qualifying auditors in such an environment. In addition, some participants expected that the audit profession would audit systems rather than papers since they predicted that the future would be paperless. Thus, some representatives of the audit firms argued that the traditional audit will be obsolete or at least its use would be less and it will be necessary to have more skilled auditors in IT. Finally, some participants

predicted that the problem of the audit trail may appear in electronic commerce. For instance, the internal audit manager of a medium-sized audit firm answered this question by saying: "*... it will be a necessity to have qualified auditors in IT. In addition, the quality of the audit will be better but its cost will be higher since training auditors in such an environment will cost audit firms. The future will test audit systems, not papers*". Another audit manager of a medium firm predicted: "*The future will be paperless since auditors will deal with IT-based accounting systems and the Internet and, in turn, auditing will be of systems. This situation demands auditors to be more competent in dealing with IT-based accounting systems so traditional auditing will be defunct or at least less-used*". A senior auditor of a large firm referred to the state of IT in SA when he answered this question: "*In general, we are late in adopting IT compared with others. However, the future will be paperless and, in turn, it will not be paper that is audited but systems. Therefore, the auditor should be qualified to audit such systems*". However, a few participants argued that even though, in the near future, there will be a great increase in the adoption of IT-based accounting systems, the audit will not be restricted to the audit of systems only. For example, one auditor of a medium-sized firm expressed this view when he said: "*In the near future, auditing will not be only limited to audit systems without vouchers and paper*".

The state of electronic commerce was investigated in Question Two in this part since participants were asked if electronic commerce is current in SA and if so, they were asked, in Question Three, to explain its effect on the audit function. The vast majority indicated that electronic commerce does not exist in SA at the present time. The interviewees explained the absence of electronic commerce in SA by mentioning the following reasons: firstly, people did not trust the Internet because of the absence of

rules which regulate such commerce in SA. Secondly, the infrastructure of communications was not capable at the present time, or even in the near future, since access to the Internet was very slow, especially at peak times. Finally, electronic commerce is not feasible in SA due to the high cost of calling and subscriptions with the providers of such a service[9]. For instance, an audit manager from a medium firm answered this question by stating that: "*electronic commerce does not exist now and it will only exist in the distant future. This is because people do not trust the Internet since the government has allowed access to it only recently. In addition, there are no rules to regulate electronic commerce in SA. For example, if a fraud is committed via the Internet, who can judge if this is a crime?*" Another audit manager of a medium-sized firm answered this question by mentioning other issues: "*electronic commerce does not exist because people do not trust it and also society is not automated. In addition, the infrastructure is not good and the cost of communication is high*".

In the last question in this section, the interviewees were asked to add any comments or to remind the researcher of any issue that he might have missed. Nine representatives out of fifteen indicated that the interview questions covered all the related issues. However, the rest (six participants) commented by returning to some issues which had already been covered by them or by others, such as the malpractice of SOCPA, the lack of competence of clients' staff in dealing with such systems, the lack of segregation between duties, and the existence of technical faults in the accounting software of their clients. They revisited such issues to emphasise that they are not the only ones whose work has faults. However, a few participants ended their interviews by emphasising that

[9] In order to have access to the Internet in SA you have to subscribe with a provider of such a service since the government controls the Internet.

audit firms must avoid imperfections in their work by confronting the requirements of an IT-based accounting environment in terms of audit approach and staff.

6.3 Conclusion

The purpose of this chapter was to report the results of the interviews that were conducted with some representatives of different sized audit firms in Saudi Arabia. The interviews aimed to acquire information related to the context of the thesis through exploring the views of the participants in the study. The rationale behind this is to provide a basis for deriving the theoretical framework of the study. The information presented in this chapter was descriptive in nature.

The findings of this preliminary study revealed that there are a number of problems in the clients' IT-based accounting environment, such as the unsuitability of clients' accounting software, the lack of competence of clients' staff in dealing with IT-based accounting systems, and the weaknesses of clients' internal control systems in such an environment. In addition, there are shortcomings in the performance of some audit firms in such an environment in terms of, among other things, applying unsuitable audit approaches and having unqualified auditors in auditing such systems. This situation seems to suggest that the auditing in an IT-based accounting environment in SA was risky.

Some of the findings that emerged from the data presented in this chapter will be incorporated in the theoretical framework of the study which will be discussed in detail in the next chapter.

CHAPTER SEVEN

THEORETICAL FRAMEWORK

7.1 Introduction

The process of exploring the influence of the adoption of IT-based accounting systems on the level of audit risk in SA has covered, so far, six chapters. The main subject of this study was introduced in Chapter One. Following this introduction, Chapter Two presented a historical perspective for the development of the audit profession; while Chapters Three and Four aimed to provide a background for the study. In addition, Chapter Five presented the research methodology that was adopted in carrying out this research and Chapter Six reported the findings of the preliminary study to explore empirically the perceptions of some members of the audit firms in SA regarding certain issues being investigated in the study.

The detail provided in the previous chapters could be perceived as descriptive in nature. However, the detail provided in the earlier chapters will be used as a basis for constructing the theoretical framework of this study due to the lack of an existing theoretical framework (model) which could be utilised in explaining the influence of the adoption of IT-based accounting systems on the level of audit risk. Such a theoretical framework might help in identifying the variables that are likely to have an influence on the level of audit risk in the IT-based accounting environment in SA. Presenting such a theoretical framework will be the main objective of this chapter.

This chapter is organised as follows: this chapter begins with an introduction to the

definition of a theoretical framework. Section Three reviews the procedures that were adopted for developing the study's theoretical framework. The theoretical framework that will be used to examine the influence of the adoption of IT-based accounting systems on the level of audit risk in SA is described in Section Four. Section Five provides the link between the theoretical framework and the empirical survey. The last section presents the conclusion of the chapter.

7.2 The Definition of the Theoretical Framework

Before going into the detail of describing how the theoretical framework of this study has been derived, it is worth providing a brief definition for the term "theoretical framework" that will be used in this chapter in order to establish a common understanding for it. Theoretical framework was defined by Sekaran (1992, p. 63) as follows: "*A theoretical framework is a conceptual model of how one theorizes the relationships among the several factors that have been identified as important to the problem ... In sum, the theoretical framework discusses the interrelationships among the variables that are deemed to be integral to the dynamics of the situation being investigated. Developing such a conceptual framework helps us to postulate and test certain relationships so as to improve our understanding of the dynamics of the situation*". This definition hints that a theoretical framework might be needed by a researcher to serve three main functions: firstly, to identify the different variables / factors relevant to the study; secondly, to develop hypotheses or questions and finally, to enhance the understanding of the situation under study.

The following section will present the procedures that were adopted in developing the theoretical framework that will be utilised in this study.

7.3. Overview of the Procedures Adopted for Constructing the Theoretical Framework of the Research

It was mentioned in Chapter Five that a grounded theory approach (i.e. the inductive approach), which normally starts with investigating the phenomenon being examined and describing its features, has been adopted for this study. The aim of this section is to present the main stages that were adopted for constructing the theoretical framework for this study. These stages are outlined briefly as follows.

The First Stage: Investigating the Phenomenon under Study

This stage could be divided into two parts. The first part (Chapters Three and Four) covered a literature review which forms the background of this study. Broadly speaking, the literature which was covered in Chapter Three gave an insight into the impact of the introduction of IT-based accounting systems on the audit function; while the literature which was covered in Chapter Four, reviewed the potential risks that are associated with auditing in an IT-based accounting environment. The second part (Chapter Six) presented the findings of the preliminary study which was considered as complementary to the first part.

The Second Stage: Summarising the Main Variables which have Emerged from the First Stage.

This stage clarifies the variables[1] that influence the level of audit risk in the IT-based accounting environment in SA as discussed in Subsection 7.4.1.

The Final Stage: Main Components of the Theoretical Framework

This stage involves the integration of the variables mentioned in the previous stage as presented in Subsection 7.4.2.

[1] The definition of the term "variable" is provided later in Subsection 7.4.2.

The next section describes in detail how the theoretical framework of this study has been derived.

7.4 Description of the Theoretical Framework's Derivation

The main stages utilised to structure the theoretical framework of the study were sketched in the previous section. Thus, this section aims to describe each stage outlined above. However, since the first stage, "Investigating the phenomenon under study", was discussed in detail in the previous chapters and summarised in the previous section, this section starts with a description of the second stage.

7.4.1 Summary of the Main Variables to be Explained by the Theoretical Framework

Based on the literature reviewed (Chapters Three and Four) and the findings of the preliminary study (Chapter Six), several key variables emerged to be related to audit risk in the IT-based accounting environment in SA. These variables will be presented under the following headings:

7.4.1.1 Variables Related to the Client's IT-based Accounting Environment

This subsection aims to introduce the variables that are expected to have an influence on the level of inherent risk and control risk in an IT-based accounting environment in SA. Such variables are as follows:

- ***The Lack of Understanding of IT of the Client's Management***

It was reported in Chapter One that the application of IT in SA in general was in its infancy compared with developed countries. In this context, the results of the preliminary study seem to suggest that the lack of understanding of IT of the client's

management is one of the most important factors that influences the level of audit risk in an IT-based accounting environment in SA. This is deduced from the following:

Firstly, the interviewees pointed out that the lack of understanding of IT of the client's management was one of the reasons behind the unsuitability of client's accounting software. The lack of understanding of IT of the client's management might lead to the adoption of accounting software that may have many faults, such as inaccurate or poor programming, poor security, offering the minimum level of information; or it may be subject to frequent breakdowns with the loss of some information. The existence of such accounting software in the client's IT-based accounting environment has implications when studying the level of inherent risk in such an environment. This is because one factor, from the factors which may influence inherent risk listed by SAS 300 at the account balance and class of transactions level (APB, 1998, Para. 2), is "*the quality of the accounting systems*". Therefore, the lack of understanding of IT of the client's management is likely to contribute to increasing the level of inherent risk in an IT-based accounting environment through the mediation of the unsuitability of a client's accounting software. This relationship can be expressed as a diagram, as shown in Figure 7.1.

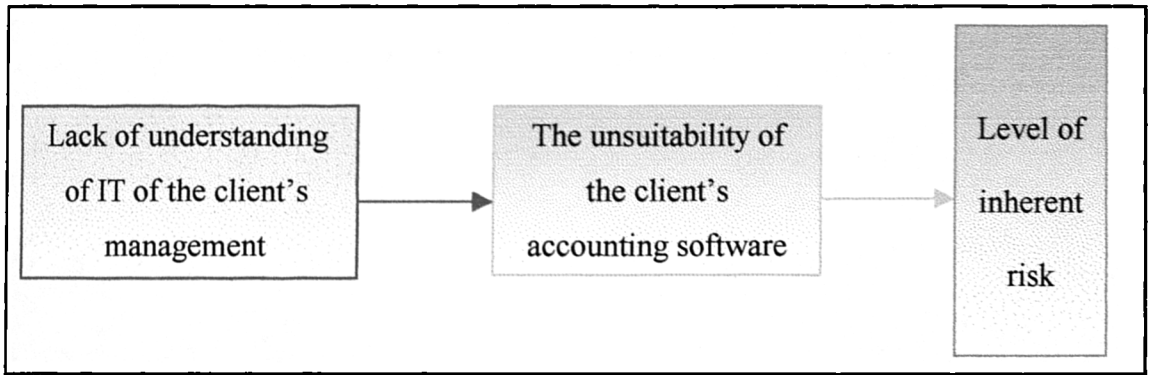

Figure 7.1 The Relationship between the Lack of Understanding of IT of the Client's Management and the Level of Inherent Risk Mediated by the Unsuitability of the Client's Accounting Software

Secondly, the interviews revealed that the lack of understanding of IT of the client's management is one of the reasons behind the lack of providing IT training by clients for their staff since they are not aware of the importance of training in improving the skills of their staff to qualify them to take advantage of IT-based accounting systems. In a wider sense, the lack of training in such an area would contribute to the lack of competence of clients' staff in dealing with IT-based accounting systems and, in some cases, this may result in mistakes. This lack of skilled human resources is one of the most important risks in an IT-based accounting environment as cited in the SAC report in 1992 and as reported in Chapter Four. The lack of competence of clients' staff in dealing with IT-based accounting systems has implications in studying the level of inherent risk in such an environment. This is because one factor, from the factors which may influence inherent risk listed by SAS 300 at the account balance and class of transactions level (APB, 1998, Para. 2), is "*the complexity of underlying transactions and other events which might require the use of the work of an expert*". As a result, the lack of understanding of IT of the client's management is likely to contribute to increasing the level of inherent risk in an IT-based accounting environment through the mediation of the lack of client's staff training in IT and the lack of competence of clients' staff in dealing with IT-based accounting systems. This relationship can be expressed as a diagram, as depicted in Figure 7.2.

Finally, the findings of the preliminary study imply that the lack of understanding of IT of the client's management is one of the reasons behind the weakness of client's internal control systems in an IT-based accounting environment since they were not aware of the nature of such an environment. The lack of understanding of IT of the client's management might lead them to apply inadequate internal controls in their IT-based

accounting environment. The existence of such internal controls in such an environment threatens the quality of data more than in manual accounting systems, as discussed earlier[2]. In particular, the application of weak internal controls in the client's IT-based accounting environment has implications when studying the level of control risk in such an environment. This can be justified by the definition of control risk which links this type of audit risk by the entity's internal control structure policies and procedures[3]. Thus, the lack of understanding of IT of the client's management is likely to contribute to increasing the level of control risk in an IT-based accounting environment through the mediation of the weakness of the client's internal control systems in such an environment. This relationship can be expressed as a diagram. See Figure 7.3.

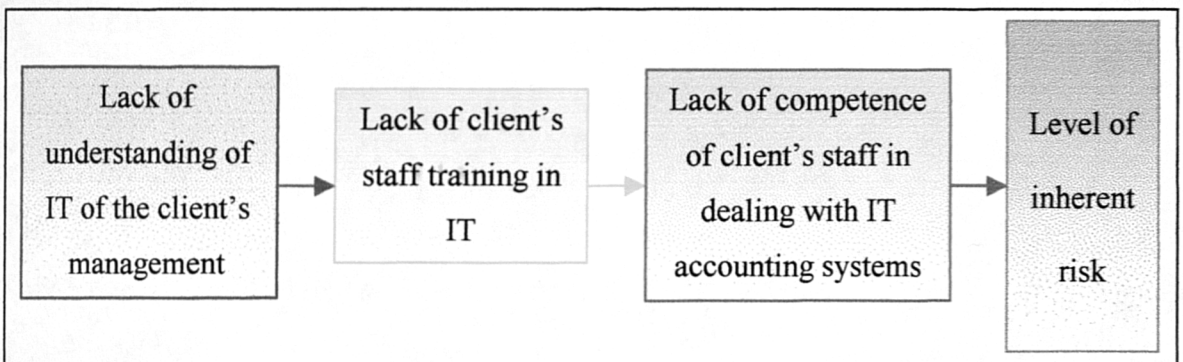

Figure 7.2 The Relationship between the Lack of Understanding of IT of the Client's Management and the Level of Inherent Risk Mediated by the Lack of Client's Staff Training in IT and the Lack of Competence of Client's Staff in Dealing with IT-based Accounting Systems

[2] For more details, see Subsections 3.2.5 and 4.4.2.
[3] The definition of control risk is provided in Subsection 4.3.2

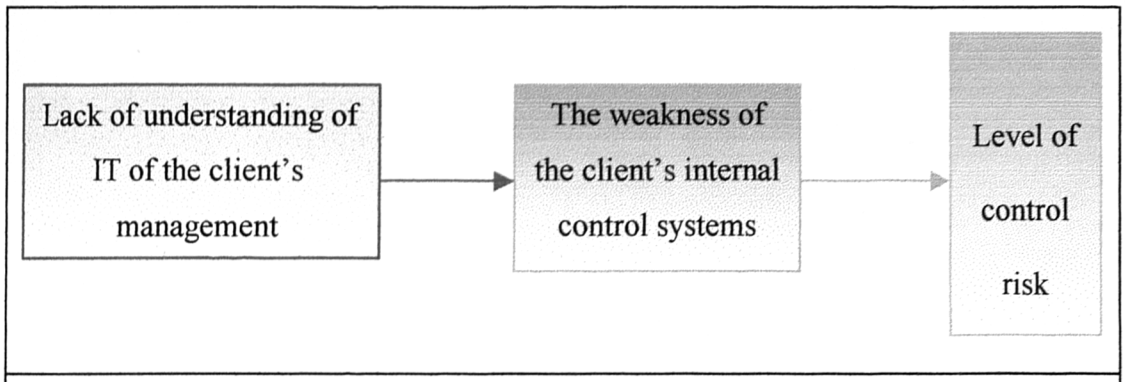

Figure 7.3 The Relationship between the Lack of Understanding of IT of the Client's Management and the Level of Control Risk Mediated by the Weakness of the Client's Internal Control Systems

- ***The Client's Financial Cost Concern***

The findings of the preliminary study seem to indicate that the client's concern about financial cost was one of the most important factors that influences the level of audit risk in an IT-based accounting environment in SA. This is inferred from the following: Firstly, the interviews implied that the clients' financial cost concern was one of the reasons behind the unsuitability of their accounting software[4]. The concentration of the clients on the cost rather than the quality of their accounting software might lead to the adoption of accounting software that has many faults or that was not compatible with the nature of the client's business, as discussed above. The application of such accounting software in the client's IT-based accounting environment has implications when studying the level of inherent risk in such an environment, as justified in the previous subsection. Thus, the client's financial cost concern is likely to contribute to increasing the level of inherent risk in an IT-based accounting environment through the

[4] The relation between the suitability of accounting software and its cost was recognised by the literature. For more details, please see Subsection 3.2.2.

mediation of the unsuitability of the client's accounting software. This relationship can be expressed as a diagram, as illustrated in Figure 7.4.

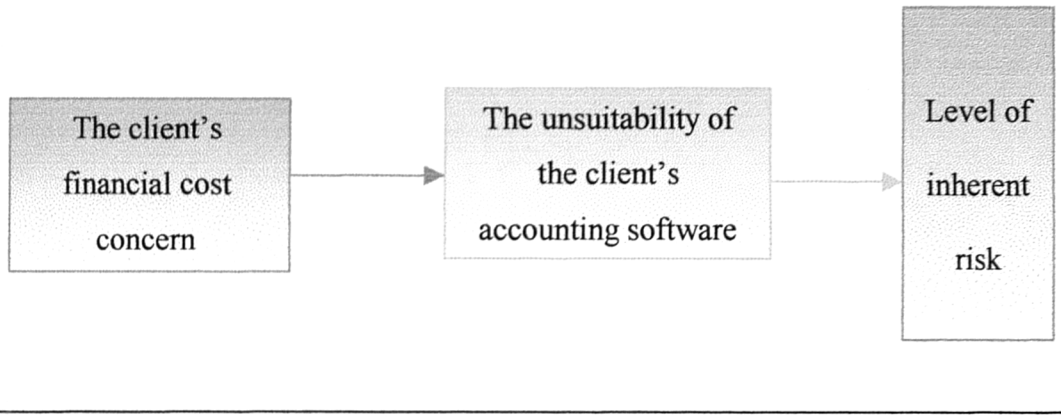

Figure 7.4 The Relationship between the Client's Financial Cost Concern and the Level of Inherent Risk Mediated by the Unsuitability of the Client's Accounting Software

Secondly, the interviews revealed that the clients' financial cost concern was one of the reasons behind the lack of competence of their staff who deal with IT-based accounting systems since the employment of skilled staff would be expensive. The issue of cost might lead clients to employ fewer skilled, or less-skilled, staff in IT-based accounting systems. The risks associated with the employment of such staff were shown in the former subsection. The lack of competence of client's staff in dealing with IT-based accounting systems has implications in studying the level of inherent risk in such an environment as justified in the foregoing subsection. Therefore, the client's financial cost concern is likely to contribute to increasing the level of inherent risk in an IT-based accounting environment through the mediation of the lack of competence of client's

staff in dealing with IT-based accounting systems. This relationship can be expressed as a diagram, as exhibited in Figure 7.5.

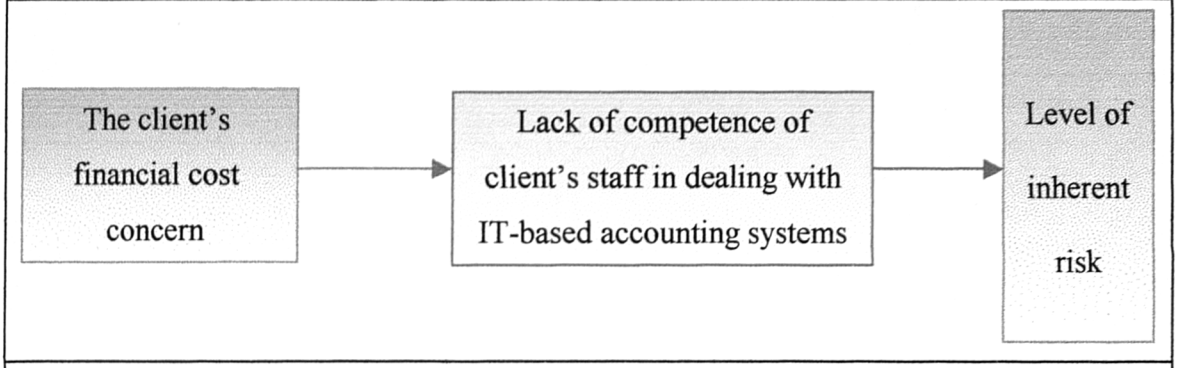

Figure 7.5 The Relationship between the Client's Financial Cost Concern and the Level of Inherent Risk Mediated by the Lack of Competence of Client's Staff in Dealing with IT-based Accounting Systems

Thirdly, the interviewees pointed out that their clients' financial cost concern was one of the reasons behind the lack of providing IT training by clients for their staff since the training of existing staff would be expensive. This lack of training in such an area would contribute to the lack of competence of clients' staff in dealing with IT-based accounting systems as highlighted above. The lack of competence of a client's staff in dealing with IT-based accounting systems has implications in studying the level of inherent risk in such an environment as justified previously. As a result, the client's financial cost concern is likely to contribute to increasing the level of inherent risk in an IT-based accounting environment through the mediation of the lack of client's staff training in IT and the lack of competence of client's staff in dealing with IT-based accounting systems. This relationship can be expressed as a diagram, as depicted in Figure 7.6.

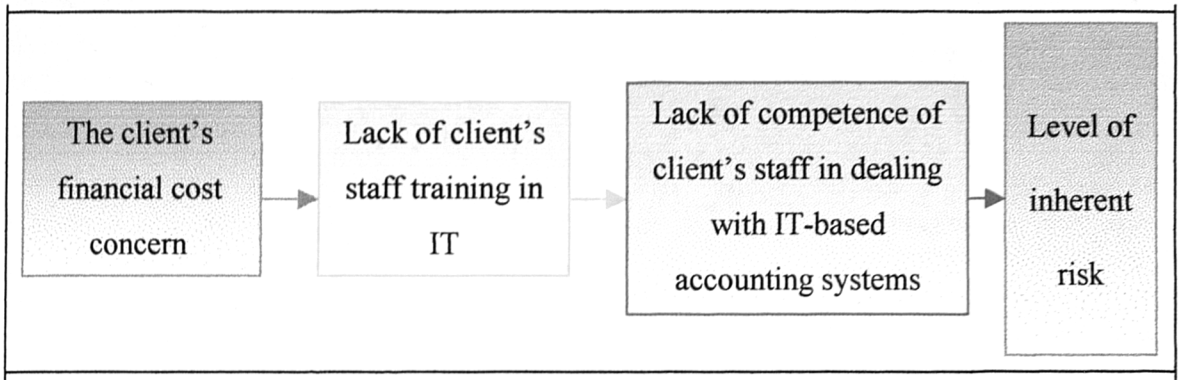

Figure 7.6 The Relationship between the Client's Financial Cost Concern and the Level of Inherent Risk Mediated by the Lack of Client's Staff Training in IT, and the Lack of Competence of Client's Staff in Dealing with IT-based Accounting Systems

Finally, the results of the preliminary study indicated that the client's financial cost concern is one of the reasons behind the weakness of the client's internal control systems in an IT-based accounting environment. In more detail, the application of proper internal controls in an IT-based accounting environment would entail, for example, segregation of duties and this, in turn, entails more staff. As a result, costs will increase. In this context, the client's financial cost concern might lead to the application of inadequate internal controls in an IT-based accounting environment. The risks associated with applying weak internal controls were explained above. This situation of applying weak internal controls in the client's IT-based accounting environment has implications when studying the level of control risk in such an environment as was justified in the preceding subsection. Therefore, the client's financial cost concern is likely to contribute to increasing the level of control risk in an IT-based accounting environment through the mediation of the weakness of the client's internal control systems in such an environment. This relationship can be expressed as a diagram. See Figure 7.7.

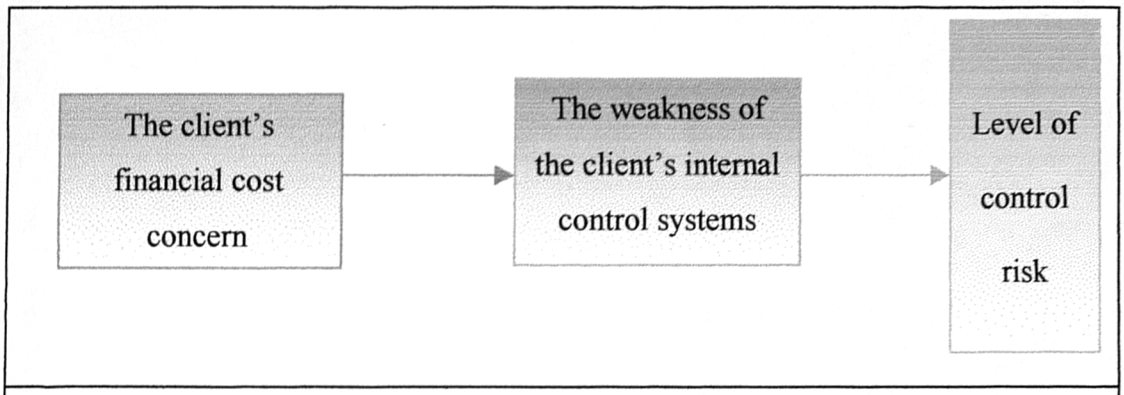

Figure 7.7 The Relationship between the Client's Financial Cost Concern and the Level of Control Risk Mediated by the Weakness of the Client's Internal Control Systems

- ***The Lack of Education in IT of the Client's Staff***

The findings of the preliminary study revealed that the lack of education in IT of the client's staff is one of the reasons behind the lack of competence of staff in dealing with IT-based accounting systems[5]. In a wider sense, teaching few, or even teaching no courses in IT at all, such as computerised accounting in theory and also how to apply it in practice, might lead to graduate students who are not able to deal efficiently with IT-based accounting systems. In addition, the employment of such staff might be a source of risk for their employers since they would make mistakes. This situation of the lack of competence of the client's staff in dealing with IT-based accounting systems has implications in studying the level of inherent risk in such an environment as was justified in the foregoing subsection. Thus, the lack of education in IT of the client's staff is likely to contribute to increasing of level of inherent risk in an IT-based accounting environment through the mediation of the lack of competence of client's staff in dealing with such systems. This relationship can be illustrated as a diagram, as

[5] This is line with the literature. For more details please see Subsection 4.4.2.

exhibited in Figure 7.8.

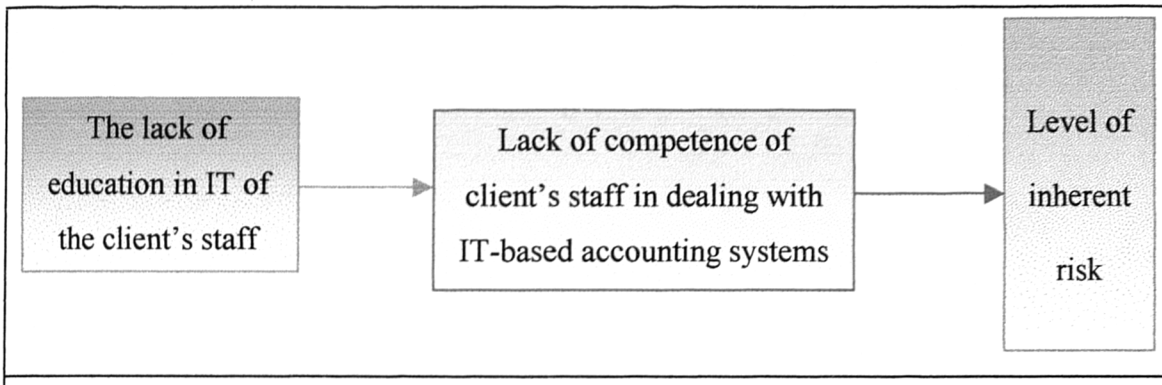

Figure 7.8 The Relationship between the Lack of Education in IT of the Client's Staff and the Level of Inherent Risk Mediated by the Lack of Competence of Client's Staff in Dealing with IT-based Accounting Systems

7.4.1.2 Variables Related to the Performance of Audit Firms in an IT-based Accounting Environment

This subsection aims to introduce the variables that are expected to have an influence on the level of detection risk in an IT-based accounting environment in SA. Such variables are as follows:

- ***The Inappropriateness of the Saudi Audit Standard in an IT-based Accounting Environment***

In the Saudi context, it was reported in Chapter Three that SOCPA issued in 1997 only one audit standard for auditing in an IT-based accounting environment. The standard requires audit firms, among other things, to use computer-assisted audit techniques (CAATs) approach. However, the findings of the preliminary study seem to suggest that a number of audit firms in SA did not adhere to the requirements of this standard in terms of their audit approach. This is because they used an auditing around the

computer approach which did not seem to be realistic and acceptable as far as the present widespread use and the sophistication of IT-based accounting systems were concerned, as was concluded in Chapter Three. In particular, the interviews revealed that the inappropriateness of the Saudi audit standard for the IT-based accounting environment in SA was one of the reasons behind the use of the auditing around the computer approach by audit firms instead of the CAATs approach. Some participants claimed that the standard was difficult for auditors to comprehend, that it is unclear, and more sophisticated than the application of IT in an accounting environment in SA since it was merely a translation of the American and International standards in this field. The inappropriateness of the audit standard in an IT-based accounting environment might lead to the application of an unsuitable audit approach (i.e. the auditing around the computer approach) by audit firms when they examine the reliability of IT-based accounting systems. This situation of using the auditing around the computer approach has implications when studying the level of detection risk in an IT-based accounting environment. This is because "*the level of detection risk relates to the auditors' substantive procedures (tests of details of transactions and balances and analytical procedures)*" (APB, 1998, Para. 7). Thus, the inappropriateness of the audit standard for the IT-based accounting environment is likely to contribute to increasing the level of detection risk in an IT-based accounting environment through the mediation of the use of the auditing around the computer approach by audit firms to inspect the reliability of IT-based accounting systems. This relationship can be expressed as a diagram, as illustrated in Figure 7.9.

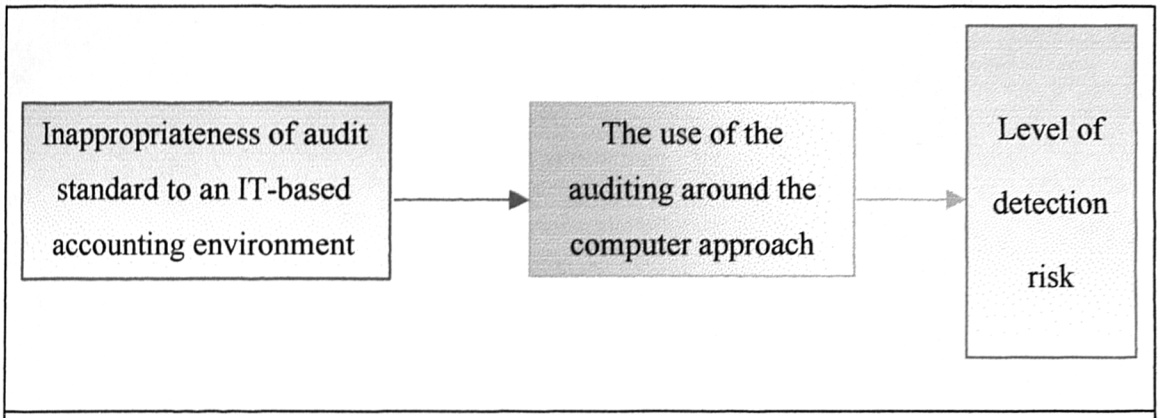

Figure 7.9 The Relationship between the Inappropriateness of the Saudi Audit Standard to an IT-based Accounting Environment and the Level of Detection Risk Mediated by the Use of the Auditing Around the Computer Approach

- ***The Audit Firm's Financial Cost Concern***

The results of the preliminary study seem to suggest that the audit firm's financial cost concern was one of the most important factors that influences the level of audit risk in an IT-based accounting environment in SA. This is deduced from the following:

Firstly, the interviews revealed that the audit firms' financial cost concern is one of the reasons behind the lack of competence of their staff who audit IT-based accounting systems since the employment of knowledgeable auditors in auditing such systems would be expensive. The issue of cost might lead audit firms to employ staff who are less-skilled in auditing IT-based accounting systems. The employment of unqualified auditors who are not able to deal with and understand the nature of such systems is one of the most important risks in an IT-based accounting environment[6]. This situation of the lack of competence of audit firms' staff in auditing IT-based accounting systems has implications in studying the level of detection risk in such an environment. This can be justified by the definition of detection risk which links this type of audit risk by the failure of auditors to collect sufficient appropriate audit evidence and/or evaluate it

[6] For more details please see Subsection 4.4.5.

properly[7]. Therefore, the audit firm's financial cost concern is likely to contribute to increasing the level of detection risk in an IT-based accounting environment through the mediation of the lack of competence of auditors in auditing IT-based accounting systems. This relationship can be expressed as a diagram. See Figure 7.10.

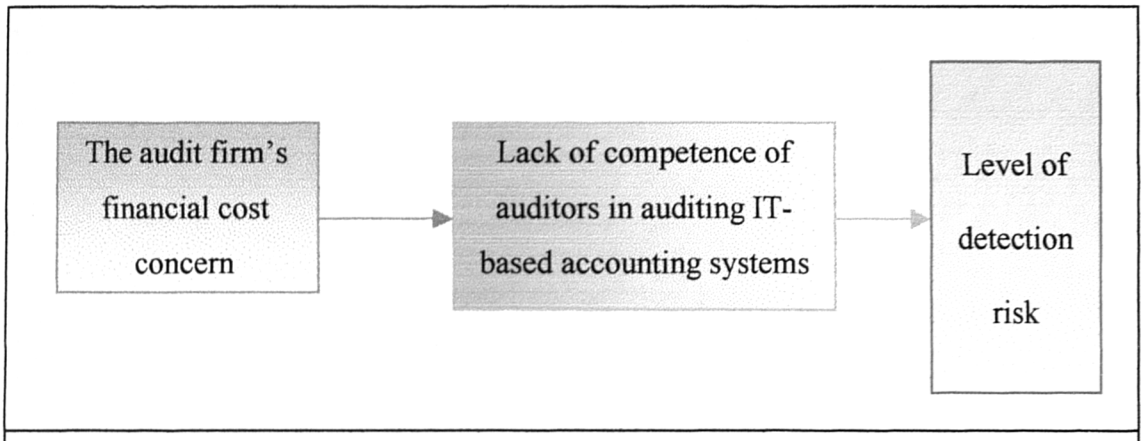

Figure 7.10 The Relationship between the Audit Firm's Financial Cost Concern and the Level of Detection Risk Mediated by the Lack of Competence of Auditors in Auditing IT-based Accounting Systems

Secondly, the interviewees implied that the audit firms' financial cost concern was one of the reasons behind the lack of competence of their staff who audit IT-based accounting systems as explained above. This lack of qualified auditors is one of the reasons that might lead audit firms not to apply the CAATs approach as required by the Saudi audit standard in an IT-based accounting environment since their staff would not be able to implement such an approach. That it would be unrealistic to use the auditing around the computer approach in an IT-based accounting environment was mentioned in the previous subsection. This situation of using the auditing around the computer approach has implications when studying the level of detection risk in an IT-based

[7] The definition of detection risk is provided in Subsection 4.3.3.

accounting environment as was justified above. As a result, the audit firms' financial cost concern is likely to contribute to increasing the level of detection risk in an IT-based accounting environment through the mediation of the lack of competence of their staff who audit IT-based accounting systems and also the use of the auditing around the computer approach by audit firms to examine the reliability of such systems. This relationship can be expressed as a diagram, as shown in Figure 7.11.

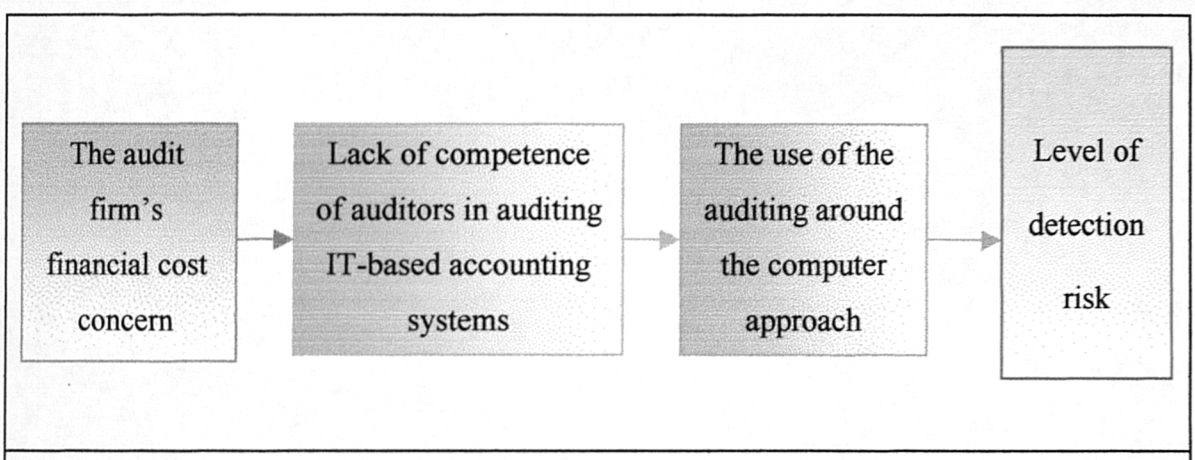

Figure 7.11 The Relationship between the Audit Firm's Financial Cost Concern and the Level of Detection Risk Mediated by the Lack of Competence of Auditors in Auditing IT-based Accounting Systems and the Use of the Auditing Around the Computer Approach

Thirdly, the results of the preliminary study seem to suggest that the audit firm's financial cost concern was one of the reasons behind the lack of providing IT training for their auditors who audit IT-based accounting systems since the training of their existing staff would be expensive. This lack of training in such an area would contribute to increasing the lack of competence of auditors in dealing with IT-based accounting systems[8]. This situation of the lack of competence of audit firms' staff in auditing IT-

[8] For more details please see Subsection 4.4.5.

based accounting systems has implications in studying the level of detection risk in such an environment as was justified previously. Therefore, the audit firm's financial cost concern is likely to contribute to increasing the level of detection risk in an IT-based accounting environment through the mediation of the lack of IT training for auditors and the lack of competence of auditors in auditing IT-based accounting systems. This relationship can be expressed as a diagram. See Figure 7.12.

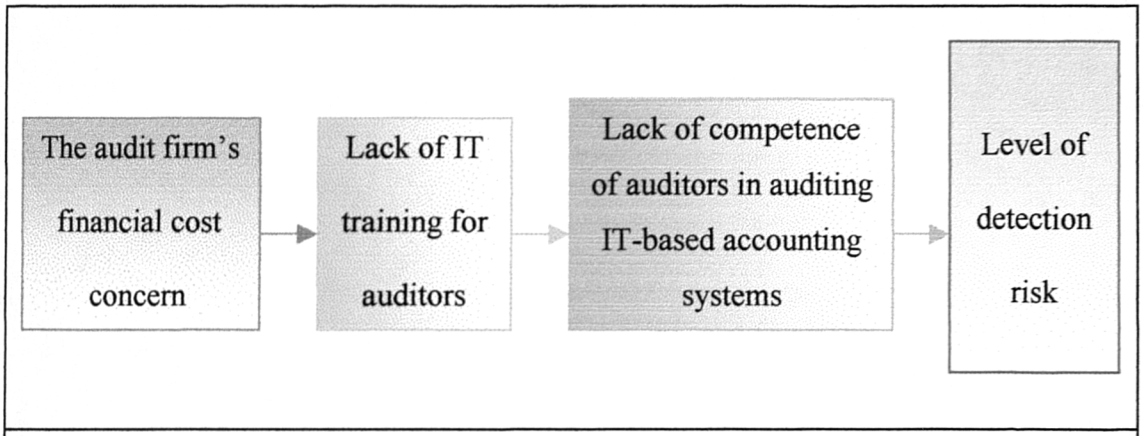

Figure 7.12 The Relationship between the Audit Firm's Financial Cost Concern and the Level of Detection Risk Mediated by the Lack of IT Training for Auditors, and the Lack of Competence of Auditors in Auditing IT-based Accounting Systems

Finally, the interviews revealed that the audit firm's financial cost concern was one of the reasons behind the lack of providing IT training for their staff who deal with IT-based accounting systems and this lack would, in turn, contribute to increasing the lack of competence of their staff in an IT-based accounting environment. This lack of competence of auditors is one of the reasons that might lead audit firms to use the auditing around the computer approach as illustrated above. This situation of using the auditing around the computer approach has implications when studying the level of detection risk in an IT-based accounting environment as was justified above. Thus, the

audit firms' financial cost concern is likely to contribute to increasing the level of detection risk in an IT-based accounting environment through the mediation of the lack of IT training for auditors, the lack of competence of their staff who audit IT-based accounting systems, and also the use of the auditing around the computer approach by audit firms to test the reliability of such systems. This relationship can be expressed as a diagram, as depicted in Figure 7.13.

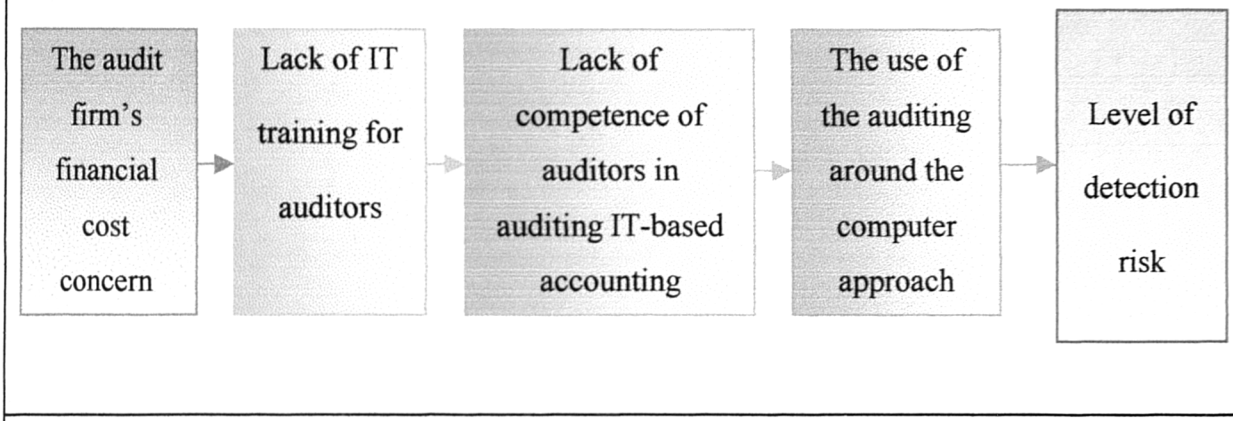

Figure 7.13 The Relationship between the Audit Firm's Financial Cost Concern and the Level of Detection Risk Mediated by the Lack of IT Training for Auditors, the Lack of Competence of Auditors in Auditing IT-based Accounting Systems, and the Use of the Auditing Around the Computer Approach

- ***The Lack of Auditors' Education in IT***

The findings of the preliminary study seem to suggest that the lack of auditors' education in IT was one of the most important factors that influences the level of audit risk in an IT-based accounting environment in SA. This is inferred from the following: Firstly, the interviewees pointed out that the lack of auditors' education in IT is one of the reasons behind the lack of competence of auditors in auditing IT-based accounting

systems[9]. In a wider sense, the lack of, or insufficient, education in IT for auditors would contribute to a reduction in their ability to deal with IT-based accounting systems. The risks associated with the lack of competence of auditors in auditing such systems were highlighted in the preceding subsections. This situation of the lack of competence of audit firms' staff in auditing IT-based accounting systems has implications in studying the level of detection risk in such an environment as was justified above. Thus, the lack of auditors' education in IT is likely to contribute to increasing the level of detection risk in an IT-based accounting environment through the mediation of the lack of competence of auditors in auditing IT-based accounting systems. This relationship can be expressed as a diagram as shown in Figure 7.14.

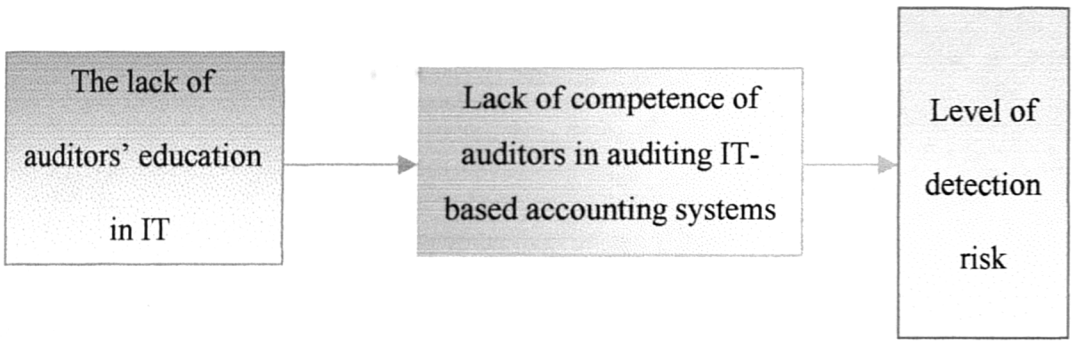

Figure 7.14 The Relationship between the Lack of Auditors' Education in IT and the Level of Detection Risk Mediated by the Lack of Competence of Auditors in Auditing IT-based Accounting Systems

[9] This is consistent with what was suggested by the literature. For more details please see Subsection 4.4.5.

Secondly, the interviews revealed that the lack of auditors' education in IT is one of the reasons behind the lack of competence of auditors in auditing IT-based accounting systems as explained above. The lack of competence of audit firms' staff would discourage their audit firms from using the CAATs approach as required by the Saudi audit standard in this environment. This situation of using the auditing around the computer approach has implications when studying the level of detection risk in an IT-based accounting environment as was justified above. As a result, the lack of auditors' education in IT is likely to contribute to increasing the level of detection risk in an IT-based accounting environment through the mediation of the lack of competence of auditors in auditing IT-based accounting systems, and also the use of the auditing around the computer approach by audit firms to examine the reliability of such systems. This relationship can be expressed as a diagram as exhibited in Figure 7.15.

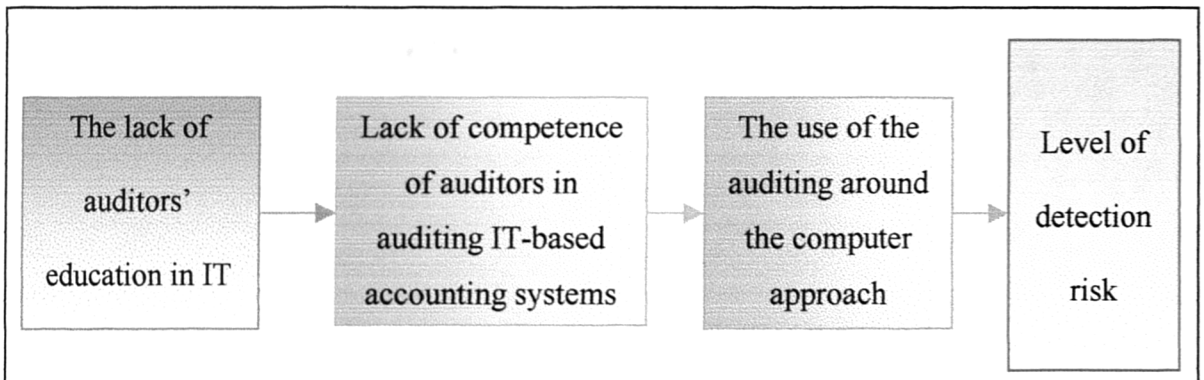

Figure 7.15 The Relationship between the Lack of Auditors' Education in IT and the Level of Detection Risk Mediated by the Lack of Competence of Auditors in Auditing IT-based Accounting Systems and the Use of the Auditing Around the Computer Approach

7.4.2 The Main Components of the Theoretical Framework

This stage involves the integration of variables mentioned in the previous stage to present the theoretical framework of the study. However, since the theoretical framework provides the conceptual foundation to proceed with the research through identifying the network of relationships among the variables considered essential to the study, it is important to understand what the term "variable" means. The term "variable" was defined by Sekaran (1992, p.64) as "*Anything that can take on differing or varying values*". In addition, she claimed that there are four main types of variables that are used in research. These types of variables are:

1- The dependent variable which is the variable of primary interest to the research.
2- The independent variable which is one that influences the dependent variable in either a negative or a positive way.
3- The moderating variable which is one that has a strong contingent effect on the independent variable-dependent variable relationship.
4- The intervening variable which is one that is both a product of the independent variable and a cause of the dependent variable (Bryaman and Cramer, 2001).

Since the aim of this research was to investigate the impact of the adoption of IT-based accounting systems by clients on audit risk in SA, this makes the variables of primary interest in this stage of the thesis the levels of the components of audit risk in an IT-based accounting environment in SA and therefore these were the dependent variables. In addition, it was found from the literature and the interviews that there were a number of independent and intervening variables that affect the variables of primary interest. For the purpose of explanation, the independent and intervening variables that influence each component of the audit risk in an IT-based accounting environment as they

emerged from the previous subsection will be illustrated first. In particular, the variables that influence the level of inherent risk in an IT-based accounting environment are exhibited in Figure 7.16, while those variables that influence the level of control risk in such an environment are shown in Figure 7.17. Lastly, Figure 7.18 presents the variables that influence the level of detection risk in an IT-based accounting environment. Then, the theoretical framework of this study that will be used to articulate the main variables (dependent, independent and intervening) as a whole, and which will be incorporated into the empirical study, will be illustrated in Figure 7.19.

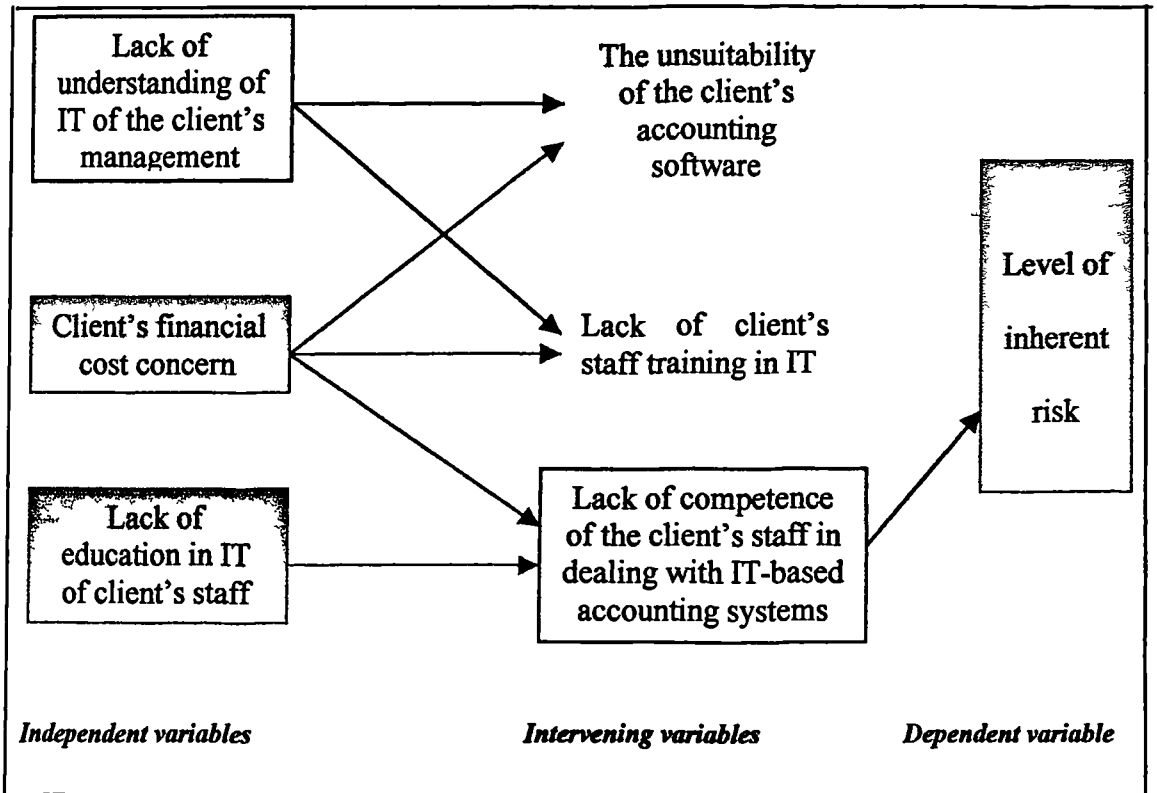

Figure 7.16 The Variables that Influence the Level of Inherent Risk in an IT-based Accounting Environment

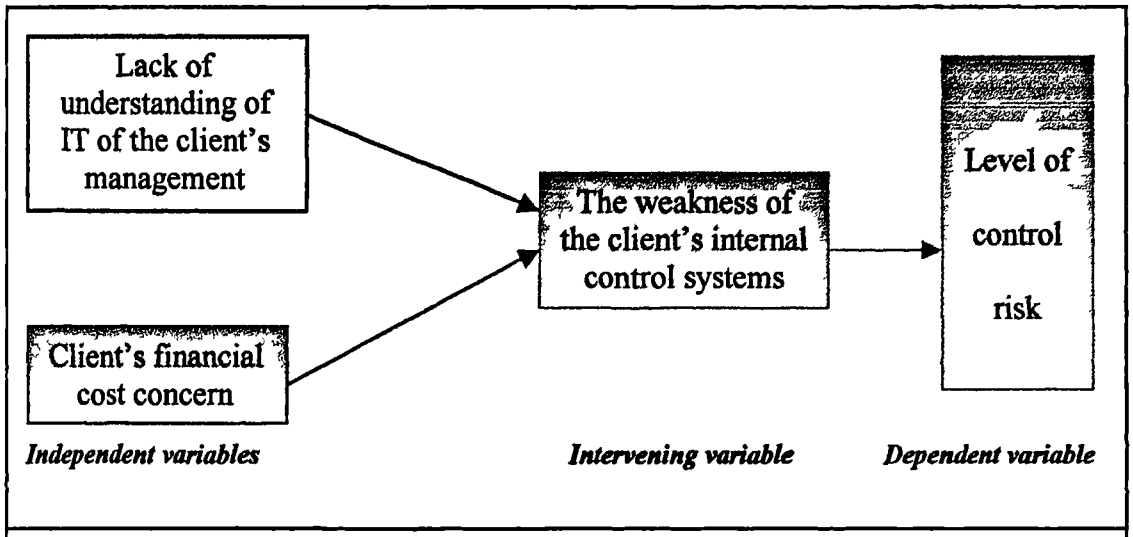

Figure 7.17 The Variables that Influence the Level of Control Risk in an IT-based Accounting Environment

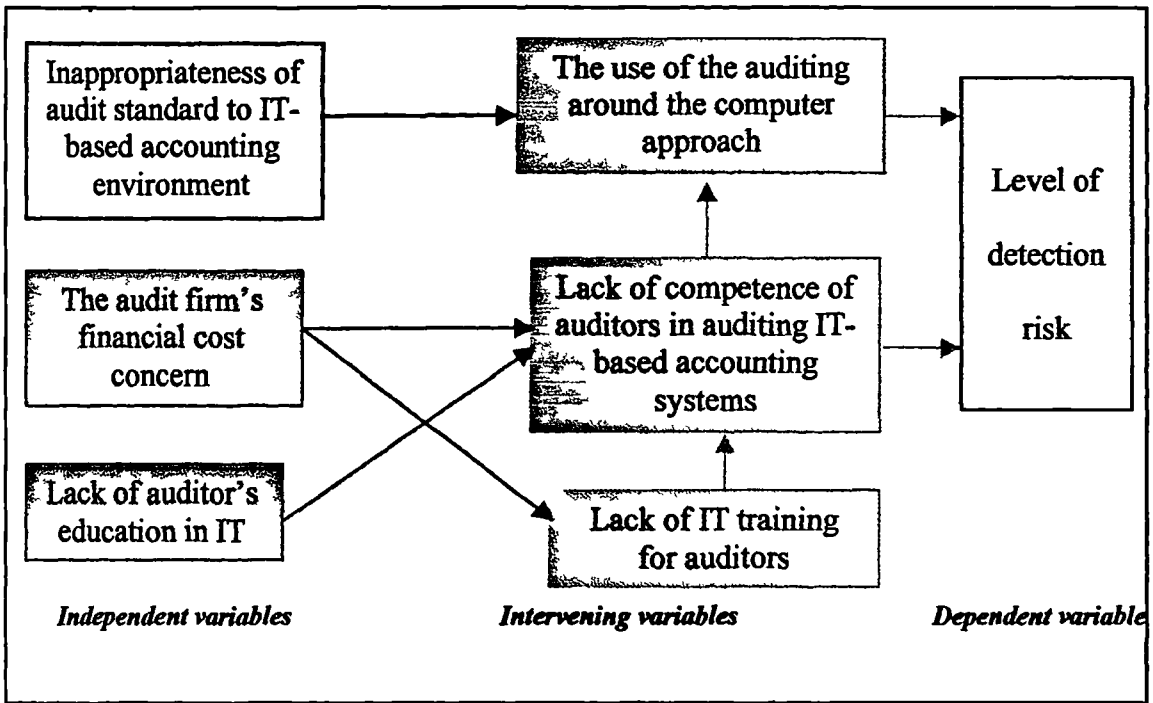

Figure 7.18 The Variables that Influence the Level of Detection Risk in an IT-based Accounting Environment

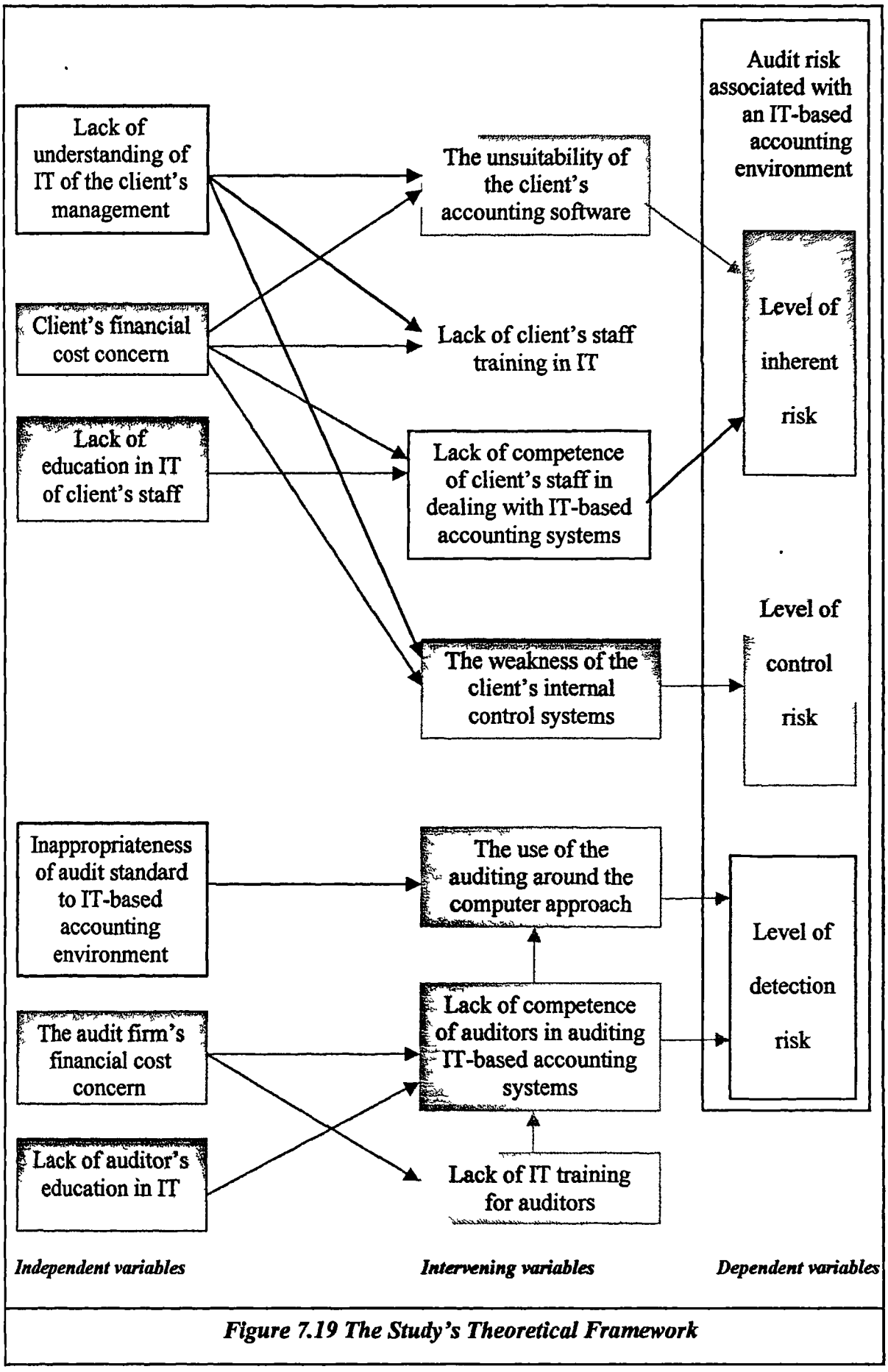

Figure 7.19 The Study's Theoretical Framework

7.5 The Link between the Theoretical Framework and the Empirical Survey

This section aims to justify the link between the theoretical framework developed in this chapter and the analysis of the empirical survey which will be discussed in detail in the next two chapters. Even though the previous section articulated a number of variables that are likely to influence the level of audit risk in an IT-based accounting environment in SA, there are, however, issues which still need to be clarified. These key issues, which will be explored in the questionnaire, are as follows:

Firstly, whether the variables articulated in the tentative theoretical framework are the only variables that affect the level of audit risk in an IT-based accounting environment in SA or whether there are other variables.

Secondly, whether the variables articulated in the tentative theoretical framework differ or not when the size of the audit firm is considered.

Finally, whether the relationships among variables are as shown in the tentative theoretical framework or are different.

7.6 Conclusion

This chapter aimed to present a theoretical framework for this study which could help in exploring the influence of the adoption of IT-based accounting systems on the level of audit risk in SA. In order to achieve this aim, the author adopted a "grounded theory" (i.e. an inductive approach) as the main approach for developing such a theoretical framework due to the lack of an existing theory/model which could be used in the investigation of the subject under scrutiny as discussed in Chapter Five. This was done by combining an examination of the literature presented in earlier chapters (Three and

Four) with the findings of the preliminary study (Chapter Six) to deduce the main variables that are likely to influence the level of audit risk in an IT-based accounting environment in SA. This combination resulted in developing the theoretical framework of the study.

The following two chapters will provide the findings of the questionnaires. Firstly, the next chapter will present the descriptive profile of the responses.

CHAPTER EIGHT

DESCRIPTIVE PROFILE OF THE RESPONSES

8.1 Introduction

Data description is the first step in any data analysis (Diamantopoulos and Schlegelmilch, 1997; Anderson et al., 1999). In general terms, descriptive statistics refer to methods for organising and summarising data. Such organising and summarising could take different forms such as frequencies, cross tabulations, tables, graphs, charts and the calculation of several descriptive indicators such as means, standard deviation and percentiles (Weiss and Weiss, 1995). Descriptive analysis provides the researcher with useful information even when the ultimate concern is inferential in nature (Sekaran, 1992; Bryman and Cramer, 2001). In particular, the purpose of descriptive analysis is to give initial insights as to the nature of the responses obtained, to check for possible data entry errors, to examine distribution shapes, and to find out whether there are outliers (Diamantopoulos and Schlegelmilch, 1997). Thus, conducting a descriptive analysis is important and worthwhile before implementing formal statistical tests.

This chapter aims to provide descriptive statistics for the perceptions of participants as a single group towards the variables included in the questionnaire in order to trace any possible trends in their perceptions of these variables. In addition, it will present inferential findings pertaining to the relationship between a demographic variable (namely, the size of audit firm) and the research variables in order to find if participants' perceptions differ from each other. Some of the respondents left some questions blank

on certain questionnaires, so the missing data were disregarded in the statistical calculations. Thus, all the percentages below are based on the actual replies on each individual item.

The chapter is organised as follows. The following section presents the demographic data of participants in the study. The third section provides the respondents' perceptions of the research variables. Finally, Section Four presents the chapter's conclusion.

8.2 Demographic Data

Statistical analysis of the questionnaires presented a wealth information concerning audit firms' characteristics and the differences among them, according to the firm's size and their clients. They will be outlined below.

8.2.1 Audit Firm Size

It was reported in Chapter Six that there is no formal classification for audit firms in Saudi Arabia, thus, in order to make sure that all sizes of audit firms in SA are represented in this research, and also to explore if there any differences among them, the researcher asked the Deputy Secretary General of SOCPA about the number of employees that can be used in the questionnaire to identify the size of the respondents' firms[1]. He suggested, after checking their records, the following classification: fewer than 6 employees is a small audit firm, from 6 to 20 employees is a medium audit firm, and more than 20 employees is a large audit firm. Table 8.1 shows the breakdown of responses in terms of the audit firms' number of employees.

[1] The use of the total number of employees as a measure of firm size is common in social science studies (e.g. Doherty and King, 1998).

Table 8.1 The Frequency Distribution of Responses by the Total Number of Employees		
Total number of employees	**Frequency**	**Percent**
Fewer than 6 (Small)	8	11.3
From 6 to 20 (Medium)	46	64.8
More than 20 (Large)	17	23.9
Total	**71**	**100**

The above table indicates that the highest frequency was for audit firms that have a number of employees ranging from 6 to 20 (i.e. medium audit firms), representing 64.8 % of the total respondents. The second largest group, which represents 23.9% of the total respondents, is audit firms that have more than 20 employees (namely, large audit firms). The last group, which represents 11.3% of the total respondents, consists of audit firms that have fewer than 6 employees (i.e. small audit firms). These results confirm that all sizes of audit firms in SA are covered in this study.

8.2.2 Clients' Use of IT-based Accounting Systems

Since this study focuses on audit firms that have clients using IT-based accounting systems, it is important to examine the proportion of audit firms' clients who have such systems. Any audit firm which did not have such clients will be excluded from the study. In addition, it is expected that audit firms with a high percentage of clients who use IT-based accounting systems may have had a greater impact on their policies. Table 8.2 presents the frequency of the proportion of audit firms whose clients use IT-based accounting systems in descending order.

Table 8.2 The Frequency Distribution of Responses by the Proportion of Clients' who Use IT-based Accounting Systems in Descending Order		
Approximate proportion of clients	**Frequency**	**Percent**
61% - 80%	29	41.4
81% - 100%	28	40
41% - 60%	9	12.9
21% - 40%	4	5.7
Total	**70**	**100**

The proportion of audit firms' clients who use IT-based accounting systems ranges from 35%[2] (one audit firm) to 100% (six audit firms). As can be noted from the above table, the highest frequencies were for audit firms the proportion of whose clients use IT-based accounting systems ranged from 61% to 80% and from 81% to 100% respectively, while the lowest frequency was for audit firms for which the proportion of clients who used IT-based accounting systems ranged from 21% to 40%. These findings indicate that more than sixty percent (>60%) of the clients of the majority of audit firms (>80%) use IT-based accounting systems. In addition, it revealed that all of the respondents had clients with IT-based accounting systems and no respondents had less than 35%. Thus, these results seem to be in line with those obtained in the preliminary study (Chapter Six).

To explore if there is any relationship between audit firm size and the proportion of clients who use IT-based accounting systems, cross tabulation of the responses was performed on these variables. The results presented in Table 8.3 showed that the proportion of all audit firms' clients who use IT-based accounting systems were in the

[2] The respondents were asked to indicate the proportion of their clients as a percentage and then their answers were categorised.

two highest categories (i.e. 61%-80% and 81%-100%). However, the data in the table seem to suggest that most of the large audit firms' clients (52.9%) were in the 81%-100% category compared with only 35.3% in the 61%-80% category. Most of the small and medium-sized audit firms' clients (42.9% and 43.5% respectively) were in the 61%-80% category compared with 28.6% and 37% in the 81%-100% category.

In summary, it could be inferred that over than half of the clients in all sizes of audit firms use IT-based accounting systems. In addition, large audit firms have more clients who use IT-based accounting systems compared with small and medium audit firms. This could be attributed to the nature of the clients of large audit firms which usually attract large companies such as banks and stock corporations.

Table 8.3 Contingency Table for Audit Firms by Proportion of Clients who Use IT-based Accounting Systems

Size of audit firm		Proportion of clients				Total
		21 - 40	*41 - 60*	*61 - 80*	*81 - 100*	
Small	Number of respondents	1	1	3	2	**7**
	Row %	*14.3%*	*14.3%*	*42.9%*	*28.6%*	*100%*
Medium	Number of respondents	3	6	20	17	**46**
	Row %	*6.5%*	*13%*	*43.5%*	*37%*	*100%*
Large	Number of respondents		2	6	9	**17**
	Row %		*11.8%*	*35.3%*	*52.9%*	*100%*

8.2.3 Type of Clients' IT-based Accounting Systems

It was reported in the preliminary study (Chapter Six) that there is a general tendency by the clients of audit firms to adopt integrated accounting systems in order to eliminate the problems associated with stand-alone accounting systems. Accordingly, including the types of accounting systems that are used by the clients of audit firms was intended

to give a general view about the nature of the IT-based accounting environment in SA, and also to check whether the views of audit firms which audit complex (i.e. an integrated accounting system) IT-based accounting systems would be different from those which audit simple systems (i.e. a stand-alone accounting system). Therefore, the respondents were asked to indicate the proportion of their clients who use integrated accounting systems and those who use stand-alone accounting systems. The respondents' replies are shown in Table 8.4 and Table 8.5 respectively.

Table 8.4 The Frequency Distribution of Responses by the Proportion of Clients who Use Integrated Accounting Systems in Descending Order

Proportion of clients	Frequency	Percent
61% - 80%	19	27.9
81% - 100%	15	22.1
21% - 40%	14	20.6
41% - 60%	10	14.7
1% - 20%	10	14.7
Total	**68**	**100**

Table 8.5 The Frequency Distribution of Responses by the Proportion of Clients who Use Stand-alone Accounting Systems in Descending Order

Proportion of clients	Frequency	Percent
1% - 20%	18	26.9
None	13	19.4
61% - 80%	11	16.4
21% - 40%	10	14.9
41% - 60%	9	13.4
81% - 100%	6	9
Total	**67**	**100**

Table 8.4 reveals that the two highest percentages (27.9% and 22.1%) were for audit firms the proportion of whose clients use integrated accounting systems ranging from

61% to 80% and from 81% to 100% respectively. On the other hand, Table 8.5 indicates that the two highest percentages (26.9% and 19.4%) were for audit firms the proportion of whose clients use stand-alone accounting systems ranging from 1% to 20% and none respectively. These findings support the results of the preliminary study in terms of: firstly, the majority of audit firms' clients adopted integrated accounting systems; secondly, there is an increased trend to adapt integrated accounting systems to eliminate the problems associated with stand-alone accounting systems as reported by interviewees in the preliminary study.

The preceding paragraph showed that most audit firms have clients with integrated accounting systems. This situation has many implications for audit firms in terms of, for instance, the necessity of applying an audit approach that is appropriate to an IT-based accounting environment (i.e. the CAATs approach, as required by the Saudi standard in such an environment), and the recruitment of qualified staff who are able to deal with IT-based accounting systems effectively. However, it is worth verifying whether this applies to all sizes of audit firms or not. In order to achieve this purpose, cross tabulation was conducted as shown in Table 8.6.

Table 8.6 Contingency Table for Audit Firms by the Proportion of Clients who Use Integrated Accounting Systems

Size of audit firm		Proportion of clients					Total
		1 - 20	*21 - 40*	*41 - 60*	*61 - 80*	*81 - 100*	
Small	Number of respondents	1	2	2	1	1	7
	Row %	*14.3%*	*28.6%*	*28.6%*	*14.3%*	*14.3%*	*100%*
Medium	Number of respondents	7	10	7	11	9	44
	Row %	*15.9%*	*22.7%*	*15.9%*	*25%*	*20.5%*	*100%*
Large	Number of respondents	2	2	1	7	5	17
	Row %	*11.8%*	*11.8%*	*5.9%*	*41.2%*	*29.4%*	*100%*

As can be noted from Table 8.6, medium and, more obviously, large audit firms have more clients who use integrated accounting systems than small audit firms. These results were, perhaps, expected since medium and large audit firms usually care about large businesses which are able, in terms of financial ability, to adopt such systems and which also require such systems.

8.3 Exploring the Respondents' Perceptions of the Research Variables

The previous section outlined the basis for presenting the results of the study. This section aims to report the respondents' perceptions regarding the research variables. In addition, it seeks to explore whether the respondents' perceptions vary when based on their audit firms' size. This section includes fourteen subsections which follow.

8.3.1 Problems in Clients' IT-based Accounting Environments

The respondents were asked to indicate their opinions with regard to how often their firms face certain potential problems in an IT-based accounting environment. In particular, these problems are: firstly, the unsuitability of the clients' accounting software (e.g. offering a minimum level of information, poor or faulty programming, poor security, and frequent breakdowns); secondly, the lack of competence of the clients' staff in dealing with IT-based accounting systems (e.g. they are unable to harness the advantages of IT systems, making mistakes etc.); thirdly, weaknesses in the clients' internal controls (e.g. no password, lack of segregation between authorities in changing data, lack of segregation between duties etc.); and finally, fraud. The

frequencies and the percentage of the respondents' perceptions of these problems are presented in Table 8.7.

Table 8.7 Respondents' Perceptions of some Problems in the Clients' IT-based Accounting Environment

Problems in Clients' Environment	*Never*	*Rarely*	*Sometimes*	*Often*	*Always*	Total
The unsuitability of the clients' accounting software	1 *1.4%*	5 *7.1%*	13 *18.6%*	38 *54.3%*	13 *18.6%*	70 *100%*
The lack of competence of the clients' staff in dealing with IT-based accounting systems		2 *2.8%*	15 *21.1%*	46 *64.8%*	8 *11.3%*	71 *100%*
Weakness of the clients' internal controls		4 *5.7%*	26 *36.6%*	27 *38%*	14 *19.7%*	71 *100%*
Fraud	11 *16.2%*	47 *69.1%*	10 *14.7%*			68 *100%*

For the purpose of clarity, a new table (Table 8.8) was generated from the above table. Table 8.8 was designed by summing up the percentages of "never" and "rarely" to become one group which is "rarely". The "sometimes" percentage was left untouched, and the percentages of "often" and "always" were summed up to become one group which is "often". In addition, the problems were ranked in descending order.

Table 8.8 Problems in the Clients' IT-based Accounting Environment in Descending Order

No	*Problems in Clients' Environment*	*Rarely*	*Sometimes*	*Often*	Total
1	The lack of competence of the clients' staff in dealing with IT-based accounting systems	*2.8%*	*21.1%*	*76.1%*	*100%*
2	The unsuitability of the clients' accounting software	*8.5%*	*18.6%*	*72.9%*	*100%*
3	Weakness of the clients' internal controls	*5.7%*	*36.6%*	*57.7%*	*100%*
4	Fraud	*85.3%*	*14.7%*		*100%*

As is evident from Table 8.8, respondents agreed as to their experience of problems 1, 2, and 3 in their clients' IT-based accounting environment. It can be noted that the highest percentage (76.1%) was for respondents who faced the lack of competence of the clients' staff in dealing with IT-based accounting systems, followed by the unsuitability of the clients' accounting software (72.9%) and weaknesses in their clients' internal controls (57.7%). In addition, it is interesting to note that 85.3% of respondents rarely faced fraud in their clients' IT-based accounting environment. A possible explanation for the low rate of fraud in an IT-based accounting environment in SA might be that the respondents' responses regarding fraud is based on discovered and not actual fraud; it might also be due to the Islamic culture which has great impact on people's lives there.

In light of the above, it can be inferred that the respondents in general are in agreement with the existence of the following problems in their clients' IT-based accounting environments: the lack of competence of their clients' staff in dealing with IT-based accounting systems, unsuitable accounting software, and weak internal controls. These results are in line with those reported in the preliminary study (Chapter Six).

While the above analysis reflects the respondents' perceptions as a group, whether or not the above problems were perceived differently when respondents' perceptions were grouped together based on their firms' size, leads to the following question:

Q1: Are there significant differences between respondents' perceptions based upon the size of the audit firm in terms of the types of problems facing them in their clients' IT-based accounting environments?

According to the results of the one-way ANOVA test, as exhibited in Table 8.9,

significant differences were found between audit firms regarding only the unsuitability of their clients accounting software (F = 3.41, P< .05). To find out which groups differ with which, paired-comparisons were conducted through the Scheffe test. The results of the test revealed that there are significant differences between respondents from medium audit firms (Mean = 3.98, S.D. = .75) on one hand, and respondents from large audit firms (Mean = 3.35, S.D. = .1.11) on the other hand. The respondents from medium audit firms rated their experiences of this problem more than another respondents did.

Overall, the vast majority of respondents admitted the existence of the above problems (listed in Table 8.7) in an IT-based accounting environment in SA, with the exception of fraud (Mean > 3). These results lead the study to investigate the reasons behind such problems and this is the subject of the next three subsections.

Table 8.9 Differences Among Audit Firms According to Problems in their Clients' IT-based Accounting Environment by One-way ANOVA

Problems in Clients' Environment	Size of Audit Firm						*F*	*Sig.*
	Small		*Medium*		*Large*			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
The unsuitability of the clients' accounting software	*3.86*	.69	*3.98*	.75	*3.35*	1.11	3.41	.039*
The lack of competence of the clients' staff in dealing with IT-based accounting systems	*4*	.76	*3.83*	.64	*3.82*	.64	.253	.777
Weakness of the clients' internal controls	*4.25*	.71	*3.67*	.90	*3.59*	.71	1.88	.160
Fraud	*1.75*	.46	*2.02*	.59	*2*	.52	.806	.451

* *Significant at the 0.05 level.*

8.3.2 Reasons for the Existence of Unsuitable Accounting Software

The foregoing subsection pointed out that one of the problems facing audit firms in an IT-based accounting environment in SA is the unsuitability of their clients' accounting software. In order to explore the reasons behind this problem, respondents were asked to rate on a five-point Likert scale their agreement with the following two reasons for the existence of unsuitable accounting software. These reasons are the concentration of the clients on cost rather than quality, and a lack of understanding of IT of clients' management (e.g. choosing accounting software which does not fully suit their activities, and from providers who offer no after-sale services). Table 8.10 exhibits the frequencies and the percentage of the replies on each of the two reasons.

Table 8.10 Respondents' Perceptions Regarding some Reasons Behind the Existence of Unsuitable Accounting Software

Reasons for Unsuitable Accounting Software	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*	Total
Clients' concentration on the cost rather than quality	2 *2.8%*	4 *5.6%*	4 *5.6%*	31 *43.7%*	30 *42.3%*	71 *100%*
Lack of understanding of IT of clients' management		4 *5.6%*	10 *14.1%*	51 *71.8%*	6 *8.5%*	71 *100%*

In order to give a clear picture, a new table (Table 8.11) was created from the above table. Table 8.11 presents the two replies at each extreme of the scale, clustered together to form a negative and a positive agreement, while neutral replies were left untouched. Moreover, the reasons were ranked in descending order.

Table 8.11 Reasons for the Existence of Unsuitable Accounting Software in Descending Order

No	*Reasons for Unsuitable Accounting Software*	*Disagree*	*Neutral*	*Agree*	Total
1	Clients' concentration on cost rather than quality	*8.4%*	*5.6%*	*86%*	*100%*
2	Lack of understanding of IT of the clients' management	*5.6%*	*14.1%*	*80.3%*	*100%*

As can be seen from the above table, the results indicate that respondents have expressed their highest agreement on both reasons as the main reasons that created the existence of unsuitable accounting software in an IT-based accounting environment in SA. In more detail, Table 8.11 revealed that the respondents perceived the first reason, namely, the concentration of the clients on cost rather than quality, to be the most likely reason behind the existence of unsuitable accounting software (86%). In addition, very high close agreement was given by participants to the second reason "lack of understanding of IT of the clients' management" (80.3%). These results could suggest that respondents believe that the concentration of the clients on cost rather than quality, and lack of understanding of IT of the clients' management, are the main reasons for the unsuitability of their clients' accounting software. Furthermore, these results are in agreement with those reported in the preliminary study (Chapter Six).

It is worthwhile, before proceeding to the next question that is related to the issue of the unsuitability of clients' accounting software, to find out whether respondents' perceptions differ with respect to their agreement on the above reasons based on their firms' size. Thus, the following question was asked:

Q2: Are there significant differences between respondents' perceptions based upon the size of their audit firms regarding the reasons behind the existence of unsuitable accounting software in their clients' IT-based accounting environment?

The results of a one-way ANOVA test demonstrated that there were no significant differences among the groups' perceptions, based on their firms' size at a five percent level of significance. In particular, Table 8.12 seems to suggest that the respondents hold the same views with respect to the reasons behind the unsuitability of their clients' accounting software. However, it was expected that significant differences would be

found between larger and smaller audit firms regarding these reasons. This is because larger audit firms mostly deal with large businesses which are expected to be less concerned about financial difficulties when they take a decision regarding their accounting software; they are also managed by more educated people who are more aware of IT issues.

To summarise, the results suggested that participants are in agreement with respect to the reasons (as provided in Table 8.12) behind the existence of unsuitable accounting software in their clients' IT-based accounting environments (Mean > 3.5).

Table 8.12 Differences Among Audit Firms Regarding Reasons for the Existence of Unsuitable Accounting Software in their Clients' IT-based Accounting Environment by One-way ANOVA

Reasons for Unsuitable Accounting Software	Size of Audit Firm						*F*	*Sig.*
	Small		*Medium*		*Large*			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
Clients' concentration on cost rather than quality	*4.50*	.53	*4.28*	.81	*3.71*	1.36	2.85	.064
Lack of understanding in IT of the clients' management	*4.13*	.64	*3.83*	.61	*3.71*	.77	1.12	.331

A related question was asked to the respondents to indicate the proportion of their clients who use ready-made[3] accounting software and those who use specific accounting software designed for their own business. As shown in Table 8.13, the majority (Mean > 60%) of the clients of audit firms use ready-made accounting software while the

[3] According to the literature and also the findings of the preliminary study, such accounting software is generally less convenient to the nature of clients' business, less accurate, and cheaper compared with software which has been designed especially for a business.

minority (Mean < 40%) of their clients use specific accounting software. The results showed that small audit firms have more clients who use ready-made accounting software (Mean = .85, S.D. = .13) than medium and large audit firms (Mean = .66, S.D. = .26 and Mean = .63, S.D. = .28, respectively). Conversely, it appears that the proportion of clients of large and medium audit firms who use specific accounting software is higher than that found in small audit firms (Mean = .35, S.D. = .29 and Mean = .30, S.D. = .25 respectively; as opposed to Mean = .15, S.D. = .13). However, a one-way ANOVA test (as illustrated in Table 8.13) pointed out that there are no significant differences among audit firms with respect to these two cases.

Table 8.13 Differences Among Audit Firms According to the Proportion of their Clients who Use Ready-made and Specific Accounting Software by One-way ANOVA

Type of Accounting Software	Size of Audit Firm						*F*	*Sig.*
	Small		*Medium*		*Large*			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
Ready-made accounting software	*.85*	.13	*.66*	.26	*.63*	.28	2.13	.126
Specific accounting software	*.15*	.13	*.30*	.25	*.35*	.29	1.81	.170

8.3.3 Reasons for the Lack of Competence of Clients' Staff in Dealing with IT-based Accounting Systems

It was reported in Subsection 8.3.1 that the lack of competence of clients' staff in dealing with IT-based accounting systems is one of the problems that faces audit firms in an IT-based accounting environment in SA. This subsection aims to explore the reasons behind this lack of competence. For the purpose of this exploration, respondents were asked to indicate their agreement with some potential reasons for the lack of competence of their clients' staff in dealing with IT-based accounting systems. The frequencies and percentage of the respondents' replies are shown in Table 8.14.

Table 8.14 Respondents' Perceptions Regarding some Reasons Behind the Lack of Competence of their Clients' Staff in Dealing with IT-based Accounting Systems

Reasons for Lack of Competence of Clients' Staff	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*	Total
Lack of IT training	2 *2.8%*	1 *1.4%*	10 *14.1%*	39 *54.9%*	19 *26.8%*	71 *100%*
Unsuitable education	2 *2.8%*	2 *2.8%*	25 *35.3%*	37 *52.1%*	5 *7%*	71 *100%*
Cost associated with training the existing staff	3 *4.3%*	4 *5.7%*	3 *4.3%*	37 *52.8%*	23 *32.9%*	70 *100%*
Cost associated with employing skilled staff	5 *7.1%*	6 *8.6%*	4 *5.7%*	27 *38.6%*	28 *40%*	70 *100%*

The above table was redesigned to give a clear picture of the respondents' perceptions on the potential reasons behind the lack of competence of the clients' staff in dealing with IT-based accounting systems. As presented in Table 8.15, the percentages of "strongly disagree" and "disagree" in the original table were put together to represent one group which is "disagree". The "neutral" percentage remains untouched. The other two percentages, "strongly agree" and "agree", were again summed together to represent one group which is "agree". Furthermore, the reasons were ranked in descending order.

Table 8.15 Reasons for the Lack of Competence of Clients' Staff in Dealing with IT-based Accounting Systems in Descending Order

No	Reasons for Lack of Competence	*Disagree*	*Neutral*	*Agree*	Total
1	Cost associated with training the existing staff	*10%*	*4.3%*	*85.7%*	100%
2	Lack of IT training	*4.2%*	*14.1%*	*81.7%*	100%
3	Cost associated with employing skilled staff	*15.7%*	*5.7%*	*78.6%*	100%
4	Unsuitable education	*5.6%*	*35.3%*	*59.1%*	100%

Taking into consideration that some of the reasons presented in Table 8.15 are interrelated with each other, the overwhelming majority of respondents' perceptions indicate high agreement with all the reasons for the lack of competence of their clients' staff in dealing with IT-based accounting systems. The reason which received the highest percentage of respondents' perceptions (85.7%) was "cost associated with training the existing staff". In addition, very high and close agreement was shown by participants to the second reason "lack of IT training" and the third reason "cost associated with employing skilled staff" (81.7% and 78.6% respectively). However, only 59.1% of the respondents indicated their agreement with the last reason, that "unsuitable education" might be the cause of the lack of competence of their clients' staff in dealing with IT-based accounting systems. These results are in line with those reported in the preliminary study (Chapter Six).

In order to examine if the respondents' perceptions, based on their firms' size, would differ regarding their agreement on the above reasons, the following question was asked:

Q3: Are there significant differences between respondents' perceptions based upon the size of their audit firms with respect to the potential reasons behind the lack of competence of their clients' staff in dealing with IT-based accounting systems?

Based on the size of the respondents' firms, a one-way ANOVA test (as provided in Table 8.16) revealed that the respondents' perceptions differ significantly on only reason two, "unsuitable education" ($F = 3.47$, $P < .05$). Paired-comparison tests according to Scheffe showed that there were significant differences between participants from large audit firms (Mean = 4, S.D. = .71) and those working in medium audit firms (Mean = 3.43, S.D. = .78). For this reason, large audit firms exhibited higher agreement

on the second reason than medium audit firms. The most likely interpretation of this result is that large audit firms deal with bigger businesses which have complex IT-based accounting systems and, in turn, require personnel with high levels of education in IT in order to deal effectively with such systems.

In conclusion, despite the differences among audit firms regarding the second reason, the above results could suggest that respondents have reported a high agreement with the reasons behind the lack of competence of their clients' staff in dealing with IT-based accounting systems in such an environment (Mean >3.5).

Table 8.16 Differences Among Audit Firms with Respect to the Potential Reasons for the Lack of Competence of their Clients' Staff in Dealing with IT-based Accounting Systems by One-way ANOVA

Reasons for the Lack of Competence of Clients' Staff	**Size of Audit Firm**						***F***	***Sig.***
	Small		***Medium***		***Large***			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
Lack of IT training	*4.38*	.92	*3.96*	.79	*4*	1	.818	.446
Unsuitable education	*3.50*	.76	*3.43*	.78	*4*	.71	3.47	.036*
Cost associated with training the existing staff	*4.13*	1.36	*4.18*	.75	*3.65*	1.32	1.81	.171
Cost associated with employing skilled staff	*3.63*	1.69	*4.07*	1.03	*3.82*	1.42	.583	.561

* Significant *at the 0.05 level*

8.3.4 Reasons for the Weakness of Clients' Internal Control Systems

The weakness in clients' internal control systems is one of the problems that faces audit firms in an IT-based accounting environment in SA, as discussed in Subsection 8.3.1. The purpose of this subsection is to highlight the reasons behind this weakness.

Accordingly, respondents were asked about their perceptions regarding the extent to which they agree on the potential reasons for the weakness of their clients' internal control systems. These reasons are the high cost associated with implementing tight internal controls (e.g. the segregation of duties in an IT-based accounting environment requires more employees); and the lack of understanding of the IT-based accounting environment of the clients' management (i.e. the clients' management is not aware of the nature of the IT-based accounting environment). The frequencies and percentage of the respondents' replies are exhibited in Table 8.17.

Table 8.17 Respondents' Perceptions Regarding some Reasons Behind the Weakness of their Clients' Internal Control Systems

Reasons for weakness of clients' internal control systems	***Strongly disagree***	***Disagree***	***Neutral***	***Agree***	***Strongly agree***	**Total**
Cost associated with implementing tight internal control systems	3 *4.2%*	4 *5.6 %*	6 *8.5%*	22 *31%*	*36* *50.7%*	**71** ***100%***
Lack of understanding of the nature of the IT-based accounting environment of the clients' management		3 *4.2 %*	12 *16.9%*	43 *60.6%*	13 *18.3%*	**71** ***100%***

For the purpose of clarity, a new table was created from the above table by clustering together the two replies at each extreme of the scale to form a negative and a positive agreement, while the neutral replies remain untouched. Moreover, the reasons were ranked in descending order, as presented in Table 8.18.

Table 8.18 Potential Reasons for the Weakness of Clients' Internal Control Systems in Descending Order					
No	**Reasons for Weakness of Clients' Internal Control Systems**	***Disagree***	***Neutral***	***Agree***	**Total**
1	Cost associated with implementing tight internal control systems	*9.8 %*	*8.5%*	*81.7%*	***100%***
2	Lack of understanding of the nature of the IT-based accounting environment of the clients' management	*4.2%*	*16.9%*	*78.9%*	***100%***

As is apparent from Table 8.18, respondents recorded relatively high agreement with both factors as reasons behind the weakness of their clients' internal control systems in an IT-based accounting environment in SA. The highest percentage of respondents' agreement (81.7%) was reported for "cost associated with implementing tight internal control systems". With respect to the "lack of understanding for the nature of the IT-based accounting environment of the clients' management", around seventy nine percent (i.e. 78.9%) of respondents indicated their agreement with this factor as a reason that might cause the weakness of their clients' internal control systems in an IT-based accounting environment. In addition, these results are similar to those reported in the preliminary study (Chapter Six).

In order to find out whether there are significant differences between participants' perceptions based on their firms' size, with respect to their agreement on the above reasons, the following question was asked:

Q4: Are there significant differences between respondents' perceptions based upon the size of their audit firms regarding the potential reasons behind the weakness of their clients' internal control systems?

A one-way ANOVA test pointed out that the respondents shared the same views and agreed regarding the above reasons being behind the weakness of their clients' internal control systems in an IT-based accounting environment. In other words, the results presented in Table 8.19 seem to suggest that there were no significant differences among the groups' perceptions, based on their firms' size with respect to the above reasons. These results are surprising since it was expected that large differences would be demonstrated between larger and smaller audit firms with respect to these reasons.

In summary, it can be concluded from the above views that the participants believe that the high cost associated with implementing tight internal control systems and the lack of understanding of the nature of the IT-based accounting environment of their clients' management are highly related to the weakness of their clients' internal control systems (Mean > 3.5).

Table 8.19 Differences Among Audit Firms According to the Potential Reasons that Cause the Weakness of Clients' Internal Control Systems by One-way ANOVA

Potential Reasons for the Weakness of Clients' Internal Control Systems	**Size of Audit Firm**						***F***	***Sig.***
	Small		***Medium***		***Large***			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
Cost associated with implementing tight internal control systems	*4*	1.41	*4.35*	.85	*3.82*	1.42	1.60	.209
Lack of understanding of the nature of the IT-based accounting environment of the clients' management	*4.25*	.71	*3.87*	.69	*3.94*	.83	.943	.394

8.3.5 Reasons for Crashes of IT-based Accounting Systems

To further investigate the state of IT-based accounting systems in SA, respondents were asked to indicate their perceptions on: (a) whether their clients' IT-based accounting systems crash and (b) how often some potential reasons cause their clients' IT-based accounting systems to crash. A summary of respondents' perceptions of the first issue is presented in Table 8.20.

Table 8.20 Respondents' Replies Regarding the Crash of their Clients' IT-based Accounting Systems

Question Asked	Answer				Total	
	YES		NO			
	Number	*Percent*	Number	*Percent*	Number	*Percent*
Do your clients' IT-based accounting systems crash?	71	*100%*			71	*100%*

The above table shows that 100% of the participants acknowledged the crash of their clients' IT-based accounting systems. This leads the study to explore the reasons which cause the crash of their clients' IT-based accounting systems. In order to explore this issue, the participants were given five reasons that IT-based accounting systems crash; they were asked to indicate their agreement on each reason. The frequencies and percentages of the respondents' perceptions on these reasons are presented in Table 8.21.

Table 8.21 Respondents' Perceptions of some Potential Reasons for the Crash of their Clients' IT-based Accounting Systems

Potential Reasons	*Never*	*Rarely*	*Sometimes*	*Often*	*Always*	Total
Fault in software	2 *2.9%*	8 *11.8%*	32 *47%*	21 *30.9%*	5 *7.4%*	68 *100%*
Lack of competence of clients' staff in dealing with IT-based accounting systems.	1 *1.5%*	7 *10.6%*	36 *54.5%*	20 *30.4%*	2 *3%*	66 *100%*
Power surge	11 *16.6%*	45 *68.3%*	9 *13.6%*	1 *1.5%*		66 *100%*
Carelessness of clients' staff	3 *4.7%*	26 *40%*	26 *40%*	9 *13.8%*	1 *1.5%*	65 *100%*
Fraud	28 *43.8%*	33 *51.5%*	3 *4.7%*			64 *100%*

For the purpose of clarity, a new table was generated from the above table by adding together the percentages of "never" and "rarely" to represent one group which is "rarely". The "sometimes" percentage remains untouched. The other two percentages, "often" and "always", were again added together to represent one group which is "often". In addition, the reasons were ranked in descending order, as exhibited in Table 8.22.

Table 8.22 Potential Reasons for the Crash of Clients' IT-based Accounting Systems in Descending Order

No	Potential Reasons for Crash	*Rarely*	*Sometimes*	*Often*	Total
1	Fault in software	14.7%	47%	38.3%	100%
2	Lack of competence of clients' staff	12.1%	54.5%	33.4%	100%
3	Carelessness of clients' staff	44.7%	40%	15.3%	100%
4	Power surge	84.9%	13.6%	1.5%	100%
5	Fraud	95.3%	4.7%		100%

Table 8.22 revealed that the respondents perceived the first two reasons to be the most likely reasons that might cause the crash of their clients' IT-based accounting systems. The percentage of frequencies for the respondents who hold these views that both a fault in software and the lack of competence of clients' staff in dealing with IT-based accounting systems often cause the crash of their clients' IT-based accounting systems are 38.3% and 33.4% respectively. The percentage of frequencies for the respondents who reported their agreement on the third reason, "carelessness of clients' staff", and the fourth reason, "power surge", are 15.3% and 1.5% respectively. In addition, the figures in the above table tend to suggest that the last reason, "fraud", is irrelevant. These results are in agreement with those reported in the previous subsections.

In order to explore whether the above reasons would be perceived differently when respondents' perceptions were grouped based on their firms' size, the following question was asked:

Q5: Are there significant differences between respondents' perceptions based upon the size of their audit firms with respect to the potential reasons that cause the crash of their clients' IT-based accounting systems?

The results of a one-way ANOVA test demonstrated that there were no significant differences among the groups' perceptions, based on their firms' size at a five percent level of significance. In other words, the data in Table 8.23 seem to suggest that the respondents share similar views regarding the reasons that cause the crash of their clients' IT-based accounting systems. These results are interesting since, for example, it might be expected that participants from large audit firms at least would be less likely to agree with these reasons compared to small audit firms.

In light of the above, it could be inferred that the participants in general are in agreement that both faults in software and the lack of competence of clients' staff in dealing with IT-based accounting systems are the main reasons behind the crash of their clients' IT-based accounting systems (Mean > 3).

Table 8.23 Differences Among Audit Firms with Respect to the Potential Reasons that Cause the Crash of their Clients' IT-based Accounting Systems by One-way ANOVA

Potential Reasons for the Crash of IT-based Accounting Systems	Size of Audit Firm						*F*	*Sig.*
	Small		*Medium*		*Large*			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
Fault in software	*3.57*	1.13	*3.26*	.83	*3.20*	.94	.451	.636
Lack of competence of clients' staff in dealing with IT-based accounting systems	*3.57*	.79	*3.20*	.72	*3.15*	.80	.859	.428
Power surge	*1.88*	.83	*2.02*	.62	*2*	.41	.194	.824
Carelessness of clients' staff	*2.57*	.98	*2.73*	.78	*2.54*	.97	.333	.718
Fraud	*1.71*	.76	*1.57*	.55	*1.69*	.63	.350	.706

8.3.6 Obstacles Regarding the Saudi Audit Standard in an IT-based Accounting Environment

In this section of the questionnaire the respondents were asked to indicate (a) whether they are acquainted with the "Audit Standard in Organisations that Use the Computer" that was issued by SOCPA in 1997; and (b) their agreement with a set of potential obstacles that might make this standard inappropriate to the IT-based accounting environment in SA. A summary of respondents' replies on the first issue is shown in Table 8.24.

Table 8.24 Respondents' Responses Regarding their Acquaintance with the Saudi Audit Standard in an IT-based Accounting Environment

Question Asked	Type of Answer				Total	
	YES		NO			
	Number	*Percent*	Number	*Percent*	Number	*Percent*
Are you acquainted with the "Audit Standard in Organisations that Use the Computer" that was issued by SOCPA in 1997?	68	*95.8%*	3	*4.2%*	71	*100%*

As demonstrated from the above table, 95.8% of respondents are acquainted with the "Audit Standard in Organisations that Use the Computer" that was issued by SOCPA in 1997, while only 4.2% of participants are not. This finding is consistent with what was reported in the preliminary study (Chapter Six) which revealed that some audit firms still know nothing about the Saudi standard even though it was issued in 1997.

Since audit firms should be guided by "Audit Standard in Organisations that Use the Computer" that was issued by SOCPA in 1997, it was intended to explore how the respondents would view some of the obstacles that might make this standard inappropriate to the IT-based accounting environment in SA. Accordingly, respondents were given three obstacles: the standard is not comprehensible to auditors, the standard is unclear, and the standard is sophisticated compared with the level of application of IT in the accounting environment in SA (i.e. it is a translation of the American and International standards in this field and is too complex for the SA setting). Then, they were asked to indicate to what extent they agreed with these obstacles. The frequencies and the percentage of the respondents' perceptions on these obstacles are presented in Table 8.25.

Table 8.25 Respondents' Perceptions Regarding some Obstacles which might Make the Saudi Audit Standard Issued in 1997 Inappropriate to the IT-based Accounting Environment in SA

Obstacle	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*	Total
The standard is not comprehensible to auditors	7 *11.3%*	20 *32.3%*	24 *38.7%*	9 *14.5%*	2 *3.2%*	62 *100%*
The standard is unclear	5 *7.9%*	30 *47.6%*	15 *23.8%*	13 *20.7%*		63 *100%*
The standard is sophisticated compared with the level of application of IT in the accounting environment in SA		7 *10.6%*	24 *36.4%*	27 *40.9%*	8 *12.1%*	66 *100%*

A new table was created from the above table to give a clearer picture by clustering together the two replies at each extreme of the scale to form a negative and a positive agreement, while the neutral replies remained untouched. Furthermore, the obstacles were ranked in descending order, as exhibited in Table 8.26.

Table 8.26 Obstacles Regarding the Saudi Audit Standard in an IT-based Accounting Environment in Descending Order

No	Obstacles Regarding the Audit Standard	*Disagree*	*Neutral*	*Agree*	Total
1	The standard is sophisticated compared with the level of application of IT in the accounting environment in SA	*10.6%*	*36.4%*	*53%*	*100%*
2	The standard is unclear	*55.5%*	*23.8%*	*20.7%*	*100%*
3	The standard is not comprehensible to auditors	*43.6%*	*38.7%*	*17.7%*	*100%*

Table 8.26 showed that the respondents perceived the first obstacle "the standard is sophisticated compared with the level of application of IT in the accounting environment in SA" to be the most likely obstacle that might make the "Audit Standard in Organisations that Use the Computer" that was issued by SOCPA inappropriate for the IT-based accounting environment in SA (53%). The percentage of frequencies for the respondents' perceptions who indicated their agreement with the second obstacle, "the standard is unclear", and the third obstacle, "the standard is not comprehensible to auditors", were 20.7% and 17.7% respectively. The highest agreement of participants on the first obstacle reflects that respondents believe that this standard is a Western standard and is therefore too complex for the SA setting. In addition, it could be in part attributed to their weak knowledge of IT as appeared from their agreement on the third reason.

In order to investigate whether the respondents' perceptions, based on their firms' size, differ with respect to the above obstacles, the following question was asked:

Q6: Are there significant differences between respondents' perceptions, based upon the size of their audit firms, regarding obstacles that might make the Saudi audit standard which was issued by SOCPA in 1997 inappropriate to an IT-based accounting environment in SA?

According to the results of a one-way ANOVA test, there were no significant differences among the participants' perceptions, based on their firms' size at a five percent level of significance. In particular, Table 8.27 seems to suggest that the respondents hold the same views with respect to the obstacles that might make the "Audit Standard in Organisations that Use the Computer" that was issued by SOCPA in 1997, inappropriate to the IT-based accounting environment in SA. These findings seem

interesting since, for example, it might be expected that participants who work in larger audit firms would be less in agreement on these reasons compared with those who work in smaller audit firms. The reason for this is that large audit firms deal with, among others, complicated or full IT-based accounting systems such as those in banks; in turn, this standard should be applicable to such an environment.

To summarise, the respondents perceived that the sophistication of the "Audit Standard in Organisations that Use the Computer" compared with the level of application of IT in the accounting environment in SA, as the main obstacle that might make it inappropriate for the Saudi environment (Mean > 3.5). The following subsections investigate the extent to which audit firms in SA apply the requirements of the audit standard in an IT-based accounting environment.

Table 8.27 Differences Among Audit Firms Regarding Obstacles Concerning the Saudi Audit Standard in an IT-based Accounting Environment by One-way ANOVA

Obstacles Regarding the Audit Standard	**Size of Audit Firm**						***F***	***Sig.***
	Small		***Medium***		***Large***			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
The standard is not comprehensible to auditors	*2.71*	1.38	*2.73*	.96	*2.47*	.83	.387	.681
The standard is unclear	*2.57*	1.13	*2.63*	.94	*2.40*	.74	.355	.702
The standard is sophisticated compared with the level of application of IT in the accounting environment in SA	*3.63*	1.06	*3.55*	.74	*3.50*	1.03	.057	.945

8.3.7 Audit Approaches in an IT-based Accounting Environment

It was reported in Chapter Three that there are two main approaches that can be used to test the integrity of IT-based accounting systems. These are auditing around the computer and computer-assisted audit techniques (CAATs) such as parallel simulations, test data, integrated test facility, and generalised audit software. In addition, it was indicated in Chapter Three that the Saudi audit standard in the IT-based accounting environment that was issued by SOCPA in 1997 recommended using the latter (i.e. CAATs). To investigate this issue within the Saudi context, respondents were asked to indicate how often the two approaches were used by their firms in examining the reliability of their clients' IT-based accounting systems. The frequencies and the percentage of the respondents' replies with respect to this issue are shown in Table 8.28.

Table 8.28 Respondents' Replies Regarding the Type of Audit Approach Used in Testing the Reliability of their Clients' IT-based Accounting Systems

Audit Approach	*Never*	*Rarely*	*Sometimes*	*Often*	*Always*	Total
Comparing input with output		2 *2.9%*	2 *2.9%*	32 *45.6%*	34 *48.6%*	**70** ***100%***
Computer-Assisted Audit Techniques (CAATs)	19 *28%*	23 *33.8%*	19 *27.9%*	5 *7.4%*	2 *2.9%*	**68** ***100%***

In order to give a clear picture, a new table was created from the above table by summing up the percentages of "never" and "rarely" to become one group which is "rarely". The "sometimes" percentage was left untouched. The other two percentages of "often" and "always" were summed up together to represent one group which is "often". In addition, the approaches were ranked in descending order, as exhibited in Table 8.29.

Table 8.29 Type of Audit Approach Used in Testing the Reliability of IT-based Accounting Systems in Descending Order					
No	**Type of Audit Approach**	***Rarely***	***Sometimes***	***Often***	**Total**
1	Comparing input with output	2.9%	*2.9%*	*94.2%*	*100%*
2	Computer-Assisted Audit Techniques	*61.8%*	*27.9%*	*10.3%*	*100%*

As is evident from the above table, the majority (94.2%) of respondents acknowledged that their firms often use the auditing around the computer approach (i.e. comparing input with output) compared with only 10.3% of respondents who indicated their use of CAATs when auditing their clients' IT-based accounting systems. In addition, it is surprising to note that 61.8% of respondents never or rarely used CAATs in testing their clients' systems while none of them never use the auditing around the computer approach in examining the reliability of their clients' accounting systems in such an environment. These findings seem to suggest that the majority of audit firms in SA do not apply CAATs as an audit approach for examining the integrity of IT-based accounting systems as required by the Saudi audit standard. Moreover, these results are in line with those reported in the preliminary study (Chapter Six).

The above analysis reflects the respondents' replies as one group. Thus, for the purpose of investigating whether the respondents share similar views with regard to the type of audit approach used in examining the reliability of their clients' systems, when the respondents' replies are grouped based on their firms' size, the following question was asked:

Q7: Are there significant differences between respondents' replies based upon the size of the audit firm in terms of the types of audit approach used in examining the reliability of their clients' IT-based accounting systems?

A one-way ANOVA test (as shown in Table 8.30) revealed that there are significant differences between audit firms regarding the use only of the second approach [CAATs] ($F = 4.19$, $P < .05$). To find out which groups differ with which, paired-comparisons were conducted through the Scheffe test. The results of the test showed that there are significant differences between participants from large audit firms (Mean = 2.82, S.D. = .95) on one hand, and respondents from medium audit firms (Mean = 2, S.D. = .93) on the other hand. These results were not, perhaps, expected because there are no significant differences between large and small audit firms in terms of using CAATs to test the reliability of their clients' systems. In addition, it was expected that medium-sized audit firms would be at least similar to small audit firms regarding the use of CAATs as an audit approach for examining the integrity of their clients' accounting systems in such an environment.

Overall, the majority of audit firms use the auditing around the computer approach for testing the reliability of their clients' IT-based accounting systems (Mean > 4). This result leads to an investigation of the reasons that might prevent audit firms from using the CAATs approach as required by the "Audit Standard in Organisations that Use the Computer" that was issued by SOCPA in 1997 when examining their clients' accounting systems. This investigation will be the subject of the next subsection.

Table 8.30 Differences Among Audit Firms According to the Type of Audit Approach Used in an IT-based Accounting Environment by One-way ANOVA

Type of Audit Approach	Size of Audit Firm						F	Sig.
	Small		*Medium*		*Large*			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
Comparing input with output	*4.50*	.53	*4.40*	.69	*4.35*	.79	.121	.887
Computer-Assisted Audit Techniques (CAATs)	*2.25*	1.39	*2*	.93	*2.82*	.95	4.19	.019*

* Significant *at the 0.05 level*

8.3.8 Reasons which might Prevent Audit Firms from Applying CAATs

The previous subsection reported that a minority of audit firms use computer-assisted audit techniques when they audit IT-based accounting systems. Thus, this subsection tries to highlight the reasons that might discourage audit firms from applying CAATs in such an environment. For this purpose, respondents were asked to give their views on some potential reasons. The frequencies and percentage of the respondents' views on given reasons are shown in Table 8.31.

Table 8.31 Respondents' Views Regarding some Reasons which might Prevent their Audit Firms from Applying CAATs in an IT-based Accounting Environment in SA

Reasons Preventing Firms from Applying CAATs	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*	Total
The lack of skilled auditors who are able to implement such techniques.	3 *4.3%*	16 *23.2%*	10 *14.5%*	31 *45%*	9 *13%*	69 *100%*
The high cost of employing knowledgeable auditors in auditing IT-based accounting systems.	4 *5.7%*	10 *14.3%*	9 *12.9%*	38 *54.2%*	9 *12.9%*	70 *100%*
The high cost of recourse to IT specialists.	4 *5.7%*	11 *15.7%*	8 *11.4%*	36 *51.5%*	11 *15.7%*	70 *100%*
Inappropriateness of the audit standard issued by SOCPA in 1997 to the IT-based accounting environment in SA.	3 *4.4%*	2 *2.9%*	24 *35.3%*	25 *36.8%*	14 *20.6%*	68 *100%*

For the purpose of clarity, a new table was generated from the above table by grouping together the two extreme replies of the scale to form a negative and a positive

agreement, while the neutral replies remain untouched. In addition, the reasons were ranked in descending order, as illustrated in Table 8.32.

Table 8.32 Reasons which might Prevent Audit Firms from Applying CAATs in an IT-based Accounting Environment in Descending Order

No	*Reasons Preventing Applying CAATs*	*Disagree*	*Neutral*	*Agree*	Total
1	The high cost of recourse to IT specialists	*21.4%*	*11.4%*	*67.2%*	*100%*
2	The high cost of employing knowledgeable auditors.	*20%*	*12.9%*	*67.1%*	*100%*
3	Lack of skilled auditors who are able to implement such techniques	*27.5%*	*14.5%*	*58%*	*100%*
4	Inappropriateness of the audit standard issued by SOCPA in 1997 to the IT-based accounting environment in SA.	*7.3%*	*35.3%*	*57.4%*	*100%*

Taking into consideration that some of the reasons presented in Table 8.32 are interrelated with each other, the overwhelming majority of respondents' perceptions indicate their agreement with all the reasons for not applying the CAATs approach in an IT-based accounting environment. The highest two percentages of respondents' agreement were reported for "the high cost of recourse to IT specialists" and "the high cost of employing knowledgeable auditors in auditing IT-based accounting systems" (67.2% and 67.1% respectively). However, only 58% of the respondents indicated their agreement with the third reason "the lack of skilled auditors who are able to implement such techniques". In addition, very high close agreements were given by participants to "inappropriateness of the audit standard issued by SOCPA in 1997 to IT-based accounting environment in SA" (57.4%). These results are similar to those reported in the preliminary study (Chapter Six).

In order to examine if the respondents' perceptions, based on their firms' size, will differ regarding their agreement on the above reasons, the following question was asked:

Q8: Are there significant differences between respondents' perceptions based upon the size of their audit firms with respect to the reasons that might prevent the use of CAATs in an IT-based accounting environment?

According to a one-way ANOVA test (as presented in Table 8.33), significant differences were found between participants' perceptions concerning only one reason, namely, the high cost of employing knowledgeable auditors ($F = 7.57$, $P < .01$). In order to obtain insights into which groups differ with which, paired-comparisons using the Scheffe test were conducted. The results of this test revealed that large audit firms (Mean = 2.76, S.D. = 1.35) tend to report less agreement with "the high cost of employing knowledgeable auditors" as a reason for not applying CAATs than both small (Mean = 4.13, S.D. = .64) and medium audit firms (Mean = 3.73, S.D. = .86). This finding was, perhaps, expected since large audit firms have more income and so the high cost factor will not be so important in the recruitment of knowledgeable auditors compared with medium and small audit firms. However, it seems surprising not to find significant differences among them regarding the other reasons "lack of skilled auditors who are able to implement such techniques", "the high cost of recourse to IT specialists" and "the inappropriateness of the audit standard issued by SOCPA in 1997 to the IT-based accounting environment in SA". With all of these reasons, it was expected that larger audit firms would express less agreement with these factors than smaller audit firms. This is because larger audit firms are expected to be less concerned with financial cost and also recruit more qualified auditors in auditing IT-based accounting systems or even have greater recourse to IT specialists than smaller audit

firms. In addition, larger audit firms usually audit larger businesses which have complicated IT-based accounting systems (such as banks) and in turn the Saudi audit standard should be more convenient to them compared with smaller audit firms as highlighted before.

In light of the above, it can be concluded that participants are in agreement with the reasons for not applying CAATs when they audit IT-based accounting systems (Mean>3).

Table 8.33 Differences Among Audit Firms Regarding Reasons that might Prevent them from Applying CAATs by One-way ANOVA

Reasons which might Prevent Audit Firms from Applying CAATs	Size of Audit Firm						*F*	*Sig.*
	Small		*Medium*		*Large*			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
Lack of skilled auditors	*3.50*	1.31	*3.51*	1.01	*3*	1.26	1.29	.281
The high cost of employing knowledgeable auditors.	*4.13*	.64	*3.73*	.86	*2.76*	1.35	7.57	.001**
The high cost of recourse to IT specialists	*3.88*	.99	*3.64*	.96	*3.18*	1.47	1.48	.234
Inappropriateness of the audit standard issued by SOCPA in 1997 to the IT-based accounting environment in SA.	*4*	.93	*3.58*	.93	*3.71*	1.16	.623	.540

** *Significant at the 0.01 level*

8.3.9 Types of Knowledge in IT Required by Audit Firms for their Staff

Having knowledge of IT for auditors who deal with IT-based accounting systems is

considered crucial; this is reported in the literature review and also emerged from the interviews' findings which were discussed in the preliminary study (Chapter Six). Furthermore, the Saudi audit standard regarding the IT-based accounting environment required auditors to have sufficient knowledge in IT in order to be able to understand the processing of transactions, and to evaluate the scope and results of the audit procedures. In addition, the standard allowed auditors recourse to the help of IT specialists on condition that auditors should have the necessary knowledge to enable them to evaluate the work of such specialists. It also emphasises that the auditors' responsibilities remain similar to those of the specialists. This subsection aims to discover the type of knowledge in IT that is required by audit firms for auditors who audit IT-based accounting systems. For this purpose, respondents were asked to indicate on a five-point scale the type of knowledge in IT that is required by their audit firms. The frequencies and the percentage of respondents' replies are illustrated in Table 8.34.

Table 8.34 Respondents' Replies with Respect to the Types of Knowledge in IT Required by their Audit Firms in an IT-based Accounting Environment

Type of Knowledge in IT	***Not required***	***Rarely required***	***Sometimes required***	***Often required***	***Highly required***	**Total**
Basic knowledge in dealing with computers	3 *4.5%*	5 *7.5%*	8 *11.9%*	25 *37.3%*	26 *38.8%*	**67** ***100%***
Basic knowledge in auditing the common, ready-made accounting software	2 *3%*	1 *1.5%*	10 *14.9%*	33 *49.3%*	21 *31.3%*	**67** ***100%***
Advanced knowledge in auditing IT-based accounting systems	2 *2.9%*	8 *11.6%*	27 *39.1%*	20 *29%*	12 *17.4%*	**69** ***100%***

A new table was created from the above table to give a clear picture by clustering together the percentage of "not required" and "rarely required" to form one group which is "rarely required". The "sometimes" percentage has been left untouched. The other two percentages, "often required" and "highly required", were again clustered together to represent one group which is "often required". Moreover, the types of knowledge in IT were ranked in descending order, as exhibited in Table 8.35.

Table 8.35 Types of Knowledge in IT Required by Audit Firms in an IT-based Accounting Environment in Descending Order

No	Type of Knowledge in IT	*Rarely required*	*Sometimes required*	*Often required*	*Total*
1	Basic knowledge in auditing the common, ready-made accounting software	*4.5%*	*14.9%*	*80.6%*	*100%*
2	Basic knowledge in dealing with computers	*12%*	*11.9%*	*76.1%*	*100%*
3	Advanced knowledge in auditing IT-based accounting systems	*14.5%*	*39.1%*	*46.4%*	*100%*

As is apparent from the above table, the vast majority of audit firms required "basic knowledge in auditing the common, ready-made accounting software" followed by "basic knowledge in dealing with computers" (80.6% and 76.1% respectively). However, only 46.4% of participants indicated that their firms required "advanced knowledge in auditing IT-based accounting systems" in such an environment. This could be attributed to the type of audit approach used by the majority of audit firms (i.e. the auditing around the computer approach which does not require knowledgeable auditors in IT). In addition, it could also be attributed to the high cost of recruitment of knowledgeable auditors in IT, as discussed in the last subsection. However, if the

requirement of basic knowledge for auditors by audit firms is linked with their acknowledgement of the high cost associated with recourse to IT specialists, this raises questions about the level of detection risk in an IT-based accounting environment in SA. Finding out whether audit firms conduct training for their staff in such an environment in order to eliminate this risk will be the subject of the next subsection. Finally, these results are similar to those obtained in the preliminary study (Chapter Six).

In order to explore whether the respondents share similar views with respect to the type of knowledge in IT required for auditors in such an environment, when the respondents' replies were grouped based on their firms' size, the following question was asked:

Q9: Are there significant differences between respondents' replies based upon the size of the audit firm in terms of the types of knowledge in IT required by their audit firms in an IT-based accounting environment?

Although the one-way ANOVA test (as provided in Table 8.36) did not reveal significant differences among the participants' perceptions based on their firms' size regarding the types of knowledge in IT required by audit firms at a five percent level of significance, a tendency was apparent: large and medium audit firms tend to require "advanced knowledge in auditing IT-based accounting systems" more than small audit firms. These results might reflect the nature of large and medium audit firms' clients who adopt complicated IT-based accounting systems and, in turn, the auditing of such systems requires qualified auditors in IT while this might not be the case with clients of small audit firms.

To summarise, the above data seem to suggest that the majority of small and medium

audit firms require basic knowledge in IT for auditors who audit IT-based accounting systems. In contrast, most of the large audit firms require advanced knowledge in auditing IT-based accounting systems.

Table 8.36 Differences Among Audit Firms Regarding the Types of Knowledge in IT Required for Auditors in an IT-based Accounting Environment by One-way ANOVA

Type of Knowledge in IT	Size of Audit Firm						*F*	*Sig.*
	Small		*Medium*		*Large*			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
Basic knowledge in dealing with computers	*3.38*	1.51	*4.04*	1.03	*4.15*	1.07	1.44	.243
Basic knowledge in auditing the common, ready-made accounting software	*4.13*	.99	*4.09*	.81	*3.85*	1.14	.396	.675
Advanced knowledge in auditing IT-based accounting systems	*2.75*	.46	*3.48*	1.03	*3.80*	1.01	3.01	.056

8.3.10 Level of Training Provided by Audit Firms to their Staff in some IT Related Areas

This subsection aims to explore the effort that has been made by audit firms to improve the skills of their staff who audit in an IT-based accounting environment. In particular, it seeks to discover which types of IT training are given to auditors who work in such an environment. For this reason, respondents were asked to indicate their perceptions on: (a) whether their firms provide IT training and, (b) the level of training given to auditors

in some IT related areas. A summary of respondents' replies on the first issue is presented in Table 8.37.

Table 8.37 Respondents' Replies Regarding their Firms' Provision of IT Training to Auditors who Audit IT-based Accounting Systems

Question Asked	Type of Answer				Total	
	YES		NO			
	Number	*Percent*	Number	*Percent*	Number	*Percent*
Does your audit firm provide IT training to auditors who audit IT-based accounting systems?	30	*42.3%*	41	*57.7%*	71	*100%*

As demonstrated from the above table, 57.7% of respondents acknowledged that their audit firms did not provide IT training to auditors who audit IT-based accounting systems while only 42.3% of them indicated that their firms provided such training. To explore if there is any relationship between providing this type of training and the size of audit firm, cross tabulation of the responses was carried out on this variable. The results (as illustrated in Table 8.38) showed that the vast majority of small and medium audit firms (75% and 63% respectively) did not provide IT training for their staff. In contrast, the majority (64.7%) of large audit firms provided such training to their staff. However, the Chi-square test (as provided in Table 8.39) did not reveal significant differences among these firms regarding the provision of IT training for their staff in an IT-based accounting environment at a five percent level of significance. Discovering the obstacles that might discourage audit firms from providing IT training for their staff will be the target of the next subsection. These findings are similar to those reported in the preliminary study (Chapter Six).

Table 8.38 Contingency Table for Audit Firms by Providing IT Training for their Staff

Size of audit firm		Type of Answer		Total
		Yes	No	
Small	Number of respondents	2	6	8
	Row %	*25%*	*75%*	*100%*
Medium	Number of respondents	17	29	46
	Row %	*37%*	*63%*	*100%*
Large	Number of respondents	11	6	17
	Row %	*64.7%*	*35.3%*	*100%*

Table 8.39 Differences Among Audit Firms Regarding the Provision of IT Training for their Staff by Chi-square

	Value	*df*	*Sig.*
Pearson Chi-square	5.017	2	.08

Before proceeding to discover the reasons that might prevent audit firms from conducting training sessions for their staff who audit IT-based accounting systems (the subject of the next subsection), it is worth highlighting the level of IT training given to auditors by audit firms which pointed out that they provide such training. Thus, participants who indicated that their firms provide such training were asked to give their views on the level of training given in the following IT related areas: basic data processing, on-line / real-time processing, system and program documentation, internal control in an IT-based accounting system and auditing in an IT-based accounting environment. The frequencies and the percentage of the respondents' replies are shown in Table 8.40.

Table 8.40 Respondents' Replies with Respect to the Level of IT Training Provided by their Audit Firms

IT Training Areas	*None*	*Very basic level*	*Low level*	*Intermediate level*	*High level*	*Very high level*	Total
Basic data processing	2 *6.9%*	1 *3.4%*	1 *3.4%*	12 *41.4%*	13 *44.9%*		**29** ***100%***
On-line / real-time processing	9 *31%*	2 *6.9%*	7 *24.1%*	6 *20.7%*	5 *17.3%*		**29** ***100%***
System and program documentation	4 *13.3%*	2 *6.7%*	3 *10%*	10 *33.3%*	11 *36.7%*		**30** ***100%***
Internal control in an IT-based accounting system	2 *6.7%*	2 *6.7%*	1 *3.3%*	6 *20%*	19 *63.3%*		**30** ***100%***
Auditing in an IT-based accounting environment	1 *3.3%*	1 *3.3%*	1 *3.3%*	10 *33.3%*	17 *56.8%*		**30** ***100%***

For the purpose of clarity, a new table was created from the above table by summing up the percentages of "very basic level" and "low level" to become one group which is "low level". In addition, the other two percentages, of "high level" and "very high level", were summed up together to represent one group which is "high level". However, the "none" and "intermediate" percentages were left untouched. Finally, IT training areas were ranked in descending order, as exhibited in Table 8.41.

Table 8.41 Level of IT Training Provided by Audit Firms in some IT Related Areas in Descending Order						
No	**IT Training Areas**	*None*	*Low Level*	*Intermediate level*	*High Level*	**Total**
1	Internal control in an IT-based accounting system	*6.7%*	*10%*	*20%*	*63.3%*	*100%*
2	Auditing in an IT-based accounting environment	*3.3%*	*6.6%*	*33.3%*	*56.8%*	*100%*
3	Basic data processing	*6.9%*	*6.8%*	*41.4%*	*44.9%*	*100%*
4	System and program documentation	*13.3%*	*16.7%*	*33.3%*	*36.7%*	*100%*
5	On-line / real-time processing	*31%*	*31%*	*20.7%*	*17.3%*	*100%*

The above table revealed that "internal control in an IT-based accounting system" received the highest level of training, followed by "auditing in an IT-based accounting environment" and "basic data processing" (percentages of 63.3%, 56.8% and 44.9% respectively). However, the percentage of frequencies for the respondents' perceptions who reported that their firms provided a high level of training in "system and program documentation" and "on-line / real-time processing" are 36.7% and 17.3% respectively. The reason behind the participants rating "on-line / real-time processing" as the lowest type might be attributed, in part, to the limited number of clients (such as banks and airlines) whose IT-based accounting systems require such skills.

In order to find out whether the above IT training areas were perceived differently when the respondents' replies were grouped based on their firms' size, the following question was asked:

Q10: Are there significant differences between respondents' replies based upon the size of the audit firm in terms of the level of training provided in some IT training areas?

The results of a one-way ANOVA test (as presented in Table 8.42) showed significant differences between participants' perceptions regarding three types of IT training. These types are basic data processing ($F = 3.99$, $P < .05$), internal control in an IT-based accounting system ($F = 8.20$, $P < .01$), and auditing in an IT-based accounting environment ($F = 10.8$, $P < .01$). In order to obtain insights into which groups differ with which, paired-comparisons using the Scheffe test were conducted. The results of this test revealed that medium audit firms tend to provide a higher level of training with respect to basic data processing than large audit firms (Mean = 4.59, S.D. = .51 as opposed to Mean = 3.50, S.D. = 1.58). In addition, it pointed out that medium and large audit firms tend to provide a higher level of training concerning internal control in an IT-based accounting system than small audit firms (Mean = 4.53, S.D. = .62; and Mean = 4.36, S.D. = 1.43 versus Mean = 1.50, S.D. = .71). Finally, the test showed that small audit firms (Mean = 2, S.D. = 1.41) tend to provide a lower level of training in auditing in an IT-based accounting environment compared with large and medium audit firms (Mean = 4.55, S.D. = .93; and Mean = 4.53, S.D. = .51 respectively).

To summarise, it could be inferred that the majority of audit firms in SA (especially small and medium firms) do not provide IT training for their staff who audit IT-based accounting systems. However, those firms which provided IT training for their staff tended to provide a high level of training in the IT related areas mentioned above except "on-line / real-time processing" (Mean > 3.5).

Table 8.42 Differences Among Audit Firms with Respect to the Level of Training Provided in some IT Related Areas by One-way ANOVA

IT Training Areas	Size of Audit Firm						*F*	*Sig.*
	Small		*Medium*		*Large*			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
Basic data processing	*3.50*	.71	*4.59*	.51	*3.50*	1.58	3.99	.031*
On-line / real-time processing	*2*	1.41	*2.82*	1.42	*3.10*	1.73	.440	.649
System and program documentation	*1.50*	.71	*3.82*	1.13	*4*	1.55	3.27	.053
Internal control in an IT-based accounting system	*1.50*	.71	*4.53*	.62	*4.36*	1.43	8.20	.002**
Auditing in an IT-based accounting environment	*2*	1.41	*4.53*	.51	*4.55*	.93	10.8	.000**

** *Significant at the 0.01 level*
* *Significant at the 0.05 level*

8.3.11 Reasons Discouraging Audit Firms from Conducting IT Training for their Staff

The previous subsection revealed that the majority of audit firms did not provide IT training to their staff who audit IT-based accounting systems. Thus, this subsection seeks to uncover the reason/reasons that might dissuade them from providing such training. For this purpose, respondents were asked to indicate their agreement on the following reason, "the high cost of training", as the main reason that might discourage their firms from conducting training sessions. The frequencies and the percentage of the respondents' perceptions are illustrated in Table 8.43.

Table 8.43 Respondents' Perceptions Regarding the Reason which might Discourage Audit Firms from Conducting IT Training for their Staff						
Reason	***Strongly disagree***	***Disagree***	***Neutral***	***Agree***	***Strongly agree***	**Total**
The high cost of training	4 *5.9%*	9 *13.2%*	11 *16.2%*	32 *47.1%*	12 *17.6%*	67 *100%*

A new table was generated from the above table to give a clear picture by grouping together the two extreme replies of the scale to form a negative and a positive agreement, while the neutral replies remain untouched, as exhibited in Table 8.44.

Table 8.44 The Reason which might Discourage Audit Firms from Conducting IT Training for their Staff				
Reason	***Disagree***	***Neutral***	***Agree***	**Total**
The high cost of training	*19.1%*	*16.2%*	*64.7%*	*100%*

Table 8.44 revealed that the respondents perceived "the high cost of training" to be the most likely obstacle that might discourage their firms from conducting IT training for auditors who audit IT-based accounting systems (percentage of 64.7%). The high agreement of participants on this reason might be attributed, in part, to the fact that most audit firms that did not provide IT training are small and medium firms. This result is in line with those reported in the preliminary study (Chapter Six).

In order to examine if the respondents' perceptions, based on their firms' size, will differ regarding their agreement on the above reason, the following question was asked:

Q11: Are there significant differences between respondents' perceptions based upon the size of their audit firms with respect to the reason that might discourage their audit firms from providing IT training?

A one-way ANOVA test (as shown in Table 8.45) revealed that there are significant differences between audit firms regarding the above reason ($F = 3.70$, $P < .05$). To find out which groups differ with which, paired-comparisons were conducted through the Scheffe test. The results of the test showed that there are significant differences between participants from large audit firms (Mean = 2.93, S.D. = 1.28) on one hand, and respondents from medium and small audit firms (Mean = 3.71, S.D. = 1.01; and Mean = 4, S.D. = .93 respectively) on the other hand. These results were, perhaps, expected because large audit firms have more income and, in turn, they will be less concerned regarding the provision of such training to their staff.

In summary, it can be concluded from the above views that the participants believe that the high cost of training is the main reason that discourages their audit firms from conducting IT training sessions.

Table 8.45 Differences Among Audit Firms with Respect to the Reason that might Discourage them from Providing IT Training by One-way ANOVA

Reason	*Size of Audit Firm*						*F*	*Sig.*
	Small		*Medium*		*Large*			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
The high cost of training	*4*	.93	*3.71*	1.01	*2.93*	1.28	3.70	.030*

* *Significant at the 0.05 level*

8.3.12 Reasons for the Lack of Competence of Auditors in Auditing IT-based Accounting Systems

This subsection aims to discover if there is any link between certain reasons and the lack of competence of auditors in auditing IT-based accounting systems. In particular, these reasons are a lack of IT training and unsuitable education (i.e. curricula in the universities and colleges do not contain any courses in IT and auditing in an IT-based

accounting environment). For this purpose, respondents were asked to indicate their opinions on the relevance of these reasons to the lack of competence of auditors in auditing such systems. The frequencies and the percentage of the respondents' perceptions are shown in Table 8.46.

Table 8.46 Respondents' Perceptions Regarding some Reasons for the Lack of Competence of Auditors in Auditing IT-based Accounting Systems

Reasons	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*	Total
Lack of IT training	1	4	6	33	25	69
	1.4%	*5.8%*	*8.7%*	*47.8%*	*36.3%*	*100%*
Unsuitable education	1	9	19	27	14	70
	1.4%	*12.9%*	*27.1%*	*38.6%*	*20%*	*100%*

For the purpose of clarity, a new table was generated from the above table by clustering together the percentage of the two extreme replies of the scale to form a negative and a positive agreement, while the neutral replies remain untouched. In addition, the factors were then ranked in descending order as presented in Table 8.47.

Table 8.47 Reasons for the Lack of Competence of Auditors in Auditing IT-based Accounting Systems in Descending Order

No	Reasons	*Disagree*	*Neutral*	*Agree*	Total
1	Lack of IT training	*7.2%*	*8.7%*	*84.1%*	*100%*
2	Unsuitable education	*14.3%*	*27.1%*	*58.6%*	*100%*

As is evident from Table 8.47, respondents recorded relatively high agreement with both reasons for the lack of competence of auditors in auditing IT-based accounting systems in SA. The highest percentage of respondents' agreement (84.1%) was reported for "lack of IT training". However, the percentage of respondents who indicated their agreement on the second factor "unsuitable education" is 58.6%. In addition, these results are similar to those reported in the preliminary study (Chapter Six).

In order to find out whether there are significant differences between participants' perceptions based on their firms' size, with respect to their agreement on the above reasons, the following question was asked:

Q12: Are there significant differences between respondents' perceptions based upon the size of their audit firms regarding the reasons behind the lack of competence of auditors in auditing IT-based accounting systems?

A one-way ANOVA test revealed that the respondents shared the same views regarding their agreement on the above reasons that might have an impact on the ability of auditors in an IT-based accounting environment. In other words, the results presented in Table 8.48 seems to suggest that there were no significant differences among the groups' perceptions, based on their firms' size with respect to both reasons.

In summary, it can be concluded from the above views that the participants believe that the lack of IT training and unsuitable education (i.e. curricula in the universities and colleges do not contain any courses in IT and auditing in an IT-based accounting environment) are highly related to the lack of competence of auditors in auditing IT-based accounting systems in SA (Mean > 3.5).

Table 8.48 Differences Among Audit Firms Regarding Reasons for the Lack of Competence of Auditors in Auditing IT-based Accounting Systems by One-way ANOVA

Reasons	Size of Audit Firm						*F*	*Sig.*
	Small		*Medium*		*Large*			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
Lack of IT training	*4.25*	.71	*4.09*	.89	*4.13*	1.06	.112	.894
Unsuitable education	*3.38*	1.41	*3.63*	.95	*3.75*	.93	.372	.691

8.3.13 Contribution of Factors to the Overall Level of Audit Risk in an IT-based Accounting Environment

In this section of the questionnaire the respondents were asked to indicate on a five-point Likert scale their views on the extent of the contribution of five factors to increases in the overall level of audit risk in an IT-based accounting environment. These factors are, firstly, using unsuitable accounting software by clients in terms of its unsuitability to the clients' activity, poor or faulty programming, providing a minimum level of information, and making tracing of the transactions difficult. The second factor includes lack of competence of clients' staff in dealing with IT-based accounting systems in terms of, for example, their inability to harness the advantages of IT systems, and in order to avoid mistakes. A third set of factors is the weakness of the clients' internal control systems in an IT-based accounting environment in terms of, for example, no password and lack of segregation between authorities in changing data and fourthly, using the auditing around the computer approach where auditors examine input and output only and where the detailed processing within the computer is ignored. A final factor is the lack of competence of auditors in auditing IT-based accounting systems in terms of, for example, their inability to use CAATs and their lack of awareness of the potential risks associated with such systems. The frequencies and the percentage of the respondents' perceptions regarding the contribution of the above factors to the overall level of audit risk in an IT-based accounting environment are illustrated in Table 8.49.

Table 8.49 Respondents' Perceptions Regarding the Contribution of some Factors to the Overall Level of Audit Risk in an IT-based Accounting Environment

Factors	*No contribution*	*Very low*	*Low*	*Medium*	*High*	*Very high*	Total
Using unsuitable accounting software by client	1 *1.4%*	2 *2.8%*	2 *2.8%*	11 *15.5%*	32 *45.1%*	23 *32.4%*	71 *100%*
Lack of competence of client's staff in dealing with IT-based accounting systems	1 *1.4%*	2 *2.8%*	3 *4.2%*	19 *26.8%*	30 *42.3%*	16 *22.5%*	71 *100%*
The weakness of the client's internal control systems in an IT-based accounting environment		3 *4.2%*	8 *11.3%*	4 *5.6%*	51 *71.9%*	5 *7%*	71 *100%*
Using the auditing around the computer approach	2 *2.8%*	1 *1.4%*	7 *9.9%*	23 *32.4%*	27 *38%*	11 *15.5%*	71 *100%*
Lack of competence of auditors in auditing IT-based accounting systems	1 *1.4%*	1 *1.4%*	7 *9.9%*	16 *22.5%*	30 *42.3%*	16 *22.5%*	71 *100%*

For the purpose of clarity, a new table was created from the above table by summing up the percentages of the "very low" and "low" level of contribution to become one group which is "low". In addition, the other two percentages, of "high" and "very high", were summed up together to represent one group which is "high". However, the "no contribution" and "medium" percentages were left untouched. Finally, factors were ranked in descending order, as exhibited in Table 8.50.

Table 8.50 Level of Contribution of some Factors to the Overall Audit Risk in an IT-based Accounting Environment in Descending Order

No	Factors	*No contribution*	*Low level*	*Medium*	*High level*	Total
1	The weakness of the client's internal control systems in an IT-based accounting environment		*15.5%*	*5.6%*	*78.9%*	*100%*
2	Using unsuitable accounting software by client	*1.4%*	*5.6%*	*15.5%*	*77.5%*	*100%*
3	Lack of competence of client's staff in dealing with IT-based accounting systems	*1.4%*	*7%*	*26.8%*	*64.8%*	*100%*
4	Lack of competence of auditors in auditing IT-based accounting systems	*1.4%*	*11.3%*	*22.5%*	*64.8%*	*100%*
5	Using the auditing around the computer approach	*2.8%*	*11.3%*	*32.4%*	*53.5%*	*100%*

The results shown in Table 8.50 seem to suggest that all the factors listed were perceived as factors which contribute to increases in the overall level of audit risk in an IT-based accounting environment in SA. However, the level of contribution of such factors could be categorised, based on the respondents' percentages, into three groups. The first two factors "the weakness of the clients' internal control systems in an IT-based accounting environment" and "using unsuitable accounting software by clients" were perceived by the majority (percentage of both > 77%) as the highest factors which contribute to increases in the overall level of audit risk. The second two factors "lack of competence of clients' staff in dealing with IT-based accounting systems" and "lack of competence of auditors in auditing IT-based accounting systems" were perceived by

more than two thirds of the respondents as subsequent factors in terms of their contribution to increases in the overall level of audit risk (64.8% for both factors). The last category, which includes factor number 5, "using the auditing around the computer approach", was perceived by 53.5% of respondents as the least important in terms of its contribution to increasing the overall level of audit risk. The participants' perceptions with respect to the last factor (using the auditing around the computer approach) might be influenced by the current practice for the majority of audit firms which apply this approach and therefore it will not be classified in terms of its contribution to the level of audit risk as highly as other factors. However, it is interesting to find that all factors were perceived as related in terms of their contribution to the overall level of audit risk by the vast majority of respondents.

In order to explore whether there are significant differences between participants' perceptions based on their firms' size, with respect to their views on the contribution of the above factors to increases in the overall level of audit risk, the following question was asked:

Q13: Are there significant differences between respondents' perceptions based upon the size of their audit firms regarding the contribution of the above factors to the overall level of audit risk in an IT-based accounting environment?

The results of a one-way ANOVA test demonstrated that there were no significant differences among the groups' perceptions, based on their firms' size at a five percent level of significance. In particular, the figures in Table 8.51 seem to suggest that the respondents share similar views regarding the level of contribution for each factor to the overall level of audit risk in an IT-based accounting environment.

In the light of the above, it could be inferred that the participants, in general, are in agreement with the contribution of the above factors to increases in the overall level of audit risk in an IT-based accounting environment (Mean > 4).

Table 8.51 Differences Among Audit Firms Regarding the Level of Contribution of some Factors to the Overall Level of Audit Risk in an IT-based Accounting Environment by One-way ANOVA

Factors	*Size of Audit Firm*						*F*	*Sig.*
	Small		*Medium*		*Large*			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
Using unsuitable accounting software by client	*4.88*	*.99*	*5.11*	.90	*4.65*	1.37	1.26	.288
Lack of competence of client's staff in dealing with IT-based accounting systems	*5*	.93	*4.80*	.96	*4.41*	1.28	1.18	.312
The weakness of the client's internal control systems in an IT-based accounting environment	*4.88*	.83	*4.65*	.90	*4.59*	1.06	.263	.769
Using the auditing around the computer approach	*4.88*	.99	*4.35*	1.18	*4.65*	.86	1.05	.353
Lack of competence of auditors in auditing IT-based accounting systems	*5.38*	.52	*4.50*	1.07	*4.94*	1.09	3.04	.054

8.3.14 Ranking of Factors which Contribute to Increases in the Overall Level of Audit Risk

This subsection seeks to discover the importance of the factors discussed in the previous subsections in terms of their contribution to increases in the overall level of audit risk in an IT-based accounting environment. For this purpose, respondents were asked to rank these factors from the most important to the least important. The frequencies and the percentage of the respondents' perceptions regarding the importance of the contribution of these factors are illustrated in Table 8.52. In addition, the factors were ranked in ascending means.

Table 8.52 Ranking of Certain Factors in Terms of the Importance of their Contribution to the Overall Level of Audit Risk in an IT-based Accounting Environment in Ascending Order

Factors	Ranking (*1= "The Most Important Factor", 5= "The Least Important Factor"*)					Total	Mean
	1	2	3	4	5		
The weakness of the client's internal control systems in an IT-based accounting environment	18 *26.1%*	20 *29%*	15 *21.7%*	10 *14.5%*	6 *8.7%*	69 ***100%***	2.51
Using unsuitable accounting software by client	22 *31.9%*	17 *24.6%*	14 *20.3%*	8 *11.6%*	8 *11.6%*	69 ***100%***	2.59
Lack of competence of client's staff in dealing with IT-based accounting systems	12 *17.4%*	21 *30.4%*	22 *31.9%*	10 *14.5%*	4 *5.8%*	69 ***100%***	2.67
Lack of competence of auditors in auditing IT-based accounting systems	19 *27.9%*	5 *7.4%*	16 *23.5%*	15 *22.1%*	13 *19.1%*	68 ***100%***	2.97
Using the auditing around the computer approach	2 *2.9%*	5 *7.4%*	1 *1.5%*	25 *36.8%*	35 *51.4%*	68 ***100%***	4.26

As is apparent from the above table, respondents perceive the weakness of the client's internal control systems in an IT-based accounting environment as the most important factor which contributes to increases in the overall level of audit risk in an IT-based accounting environment with an average of 2.51. This was followed by using unsuitable accounting software by clients with an average of 2.59. The third was the lack of competence of a client's staff in dealing with IT-based accounting systems with an average of 2.67; while the fourth was lack of competence of auditors in auditing IT-based accounting systems with an average of 2.97. However, the last was using the auditing around the computer approach with an average of 4.26. In addition to the above, the results of a one-way ANOVA test (provided in Table 8.53) demonstrated that there were no significant differences among the groups' perceptions, based on their firms' size, regarding the ranking of the above factors in terms of the importance of their contribution to increases in the overall level of audit risk in an IT-based accounting environment at a five percent level of significance. Finally, it is interesting to note, by comparing the results of Tables 8.50 and 8.52, that these factors were rated in terms of their contribution and also their importance to increases in the overall level of audit risk by the respondents in the same order. In other words, the findings of the two tables are compatible. Thus, the results reported in this subsection support those obtained in the previous subsection.

Table 8.53 Differences Among Audit Firms Regarding the Ranking of Certain Factors in Terms of the Importance of their Contribution to the Overall Level of Audit Risk in an IT-based Accounting Environment by One-way ANOVA

Factors	*Size of Audit Firm*						*F*	*Sig.*
	Small		*Medium*		*Large*			
	Mean	S.D.	*Mean*	S.D.	*Mean*	S.D.		
The weakness of the client's internal control systems in an IT-based accounting environment	*2.25*	1.04	*2.51*	1.27	*2.63*	1.41	.229	.796
Using unsuitable accounting software by client	*2.38*	1.30	*2.67*	1.40	*2.50*	1.46	.194	.824
Lack of competence of client's staff in dealing with IT-based accounting systems	*2.13*	.99	*2.78*	1.15	*2.63*	1.15	1.14	.324
Lack of competence of auditors in auditing IT-based accounting systems	*3.75*	1.49	*2.80*	1.52	*3.07*	1.33	1.44	.243
Using the auditing around the computer approach	*4.50*	.53	*4.24*	1	*4.20*	1.26	.248	.781

8.4 Conclusion

It was reported in the introduction that the objective of this chapter is to provide a descriptive analysis in order to explore the perceptions of participants towards the research variables; also to present an inferential analysis to find out if participants' perceptions differ from each other based on a demographic variable (i.e. the size of audit firm). Several interesting findings have emerged from the participants' perceptions of the research variables explored in this study. Among the most important are the following:

Firstly, the respondents believe that the unsuitability the clients' accounting software, the lack of competence of the clients' staff in dealing with IT-based accounting systems and the weakness of the clients' internal controls are the only problems that face their audit firms in their clients' IT-based accounting environment in SA. Exploring the views of the participants in this study regarding the reasons behind each problem revealed that respondents believe that the clients' concentration on cost rather than quality, and the lack of understanding of IT of the clients' management, are the sole reasons behind the existence of unsuitable accounting software in their clients' IT-based accounting environment. With respect to the second problem, "the lack of competence of the clients' staff in dealing with IT-based accounting systems", participants felt that a lack of training, unsuitable education, the high cost associated with training existing staff and the high cost associated with employing skilled staff were the main reasons behind this problem. Respondents considered costs associated with implementing tight internal control systems and the lack of understanding of the clients' management of the nature of IT-based accounting systems are the only reasons behind the weaknesses of their clients' internal control systems.

Secondly, according to the participants' perceptions, the most likely obstacle that might make the "*Audit Standard in Organisations that Use the Computer*" that was issued by SOCPA in 1997, inappropriate to the IT-based accounting environment in SA is the sophistication of this standard.

Thirdly, the overwhelming majority of respondents indicated that their firms use the auditing around the computer approach when they test the reliability of their clients' IT-based accounting systems and do not apply the CAATs approach as required by the Saudi audit standard. Exploring the views of the participants in this study regarding the reasons that could prevent their firms from applying CAATs, the responses revealed that respondents believe that a lack of skilled auditors and the inappropriateness of the audit standard to the IT-based accounting environment in SA, are the factors which hinder their firms from applying CAATs.

Fourthly, according to the participants' perceptions, most audit firms (mainly, small and medium firms) require a basic knowledge of IT for auditors who deal with IT-based accounting systems, while the case is the opposite for large audit firms which often require advanced knowledge of IT for their staff in such an environment.

Fifthly, the vast majority of participants pointed out that their firms did not provide IT training for auditors who audit IT-based accounting systems. Investigating the perceptions of respondents with respect to the reasons that might discourage their firms from providing such training to their staff showed that the participants feel that the main reason is the high cost of such training.

Sixthly, the respondents believed that both a lack of IT training and also unsuitable education, are the sole reasons for the lack of competence of auditors in auditing IT-based accounting systems.

Seventhly, participants believe that using unsuitable accounting software by clients, the lack of competence of clients' staff in dealing with IT-based accounting systems, the weakness of the clients' internal control systems in an IT-based accounting environment, using the auditing around the computer approach, and lack of competence of auditors in auditing IT-based accounting systems, all contribute to increases in the overall level of audit risk in an IT-based accounting environment in SA.

Finally, the results reported in this chapter are similar to those obtained in the preliminary study (Chapter Six). In other words, it could be inferred that the research variables that emerged from the preliminary study (on which the theoretical framework is based) and which are confirmed in the main study are the only variables related to audit risk in an IT-based accounting environment in SA.

The next chapter will examine the relationships between the variables of the study as suggested by the research model that was presented in Chapter Seven.

CHAPTER NINE

RELATIONSHIPS BETWEEN THE VARIABLES OF THE RESEARCH

9.1 Introduction

The previous chapter presented the perceptions and views regarding the variables that emerged from the preliminary study in order to verify the variables related to audit risk in an IT-based accounting environment in SA. This lead the research to study the relationships between these variables as suggested by the theoretical framework presented in Chapter Seven. Thus, the aim of this chapter is statistically to explore the relationships between the variables identified. The exploration of these relationships will be conducted via two stages. In the first stage, these relationships will be examined through Pearson correlations. In the subsequent stage, path analysis will be carried out in order to probe the research model.

This chapter will be organised as follows: following this introduction, Section Two presents the results of the Pearson correlations among the variables of the research. Section Three reports the findings of the path analysis and the last section introduces the chapter's conclusion.

9.2 Correlational Analysis

This section aims to report a description of the relationships among the variables of the research in the most rudimentary fashion to show the simple bivariate correlations that underlie the models which will be estimated in the next section.

9.2.1 Exploring the Relationships Between Variables Related to the Inherent Risk Model in an IT-based Accounting Environment

The theoretical framework, discussed in Chapter Seven, suggests that there are seven variables in the inherent risk model in an IT-based accounting environment in SA as shown in Figure 9.1. The model includes three independent variables, three intervening variables, and one dependent variable. Their details are as follows. Firstly, the independent variables are the lack of understanding of IT of the client's management, the client's financial cost concern, and the lack of education in IT of the client's staff. Secondly, the intervening variables are the unsuitability of accounting software in the client's IT-based accounting environment, the lack of client's staff training in IT, and the lack of competence of client's staff in dealing with IT-based accounting systems. Finally, the dependent variable is the level of inherent risk. The aim of this subsection, therefore, is to investigate these relationships by employing the Pearson correlation test.

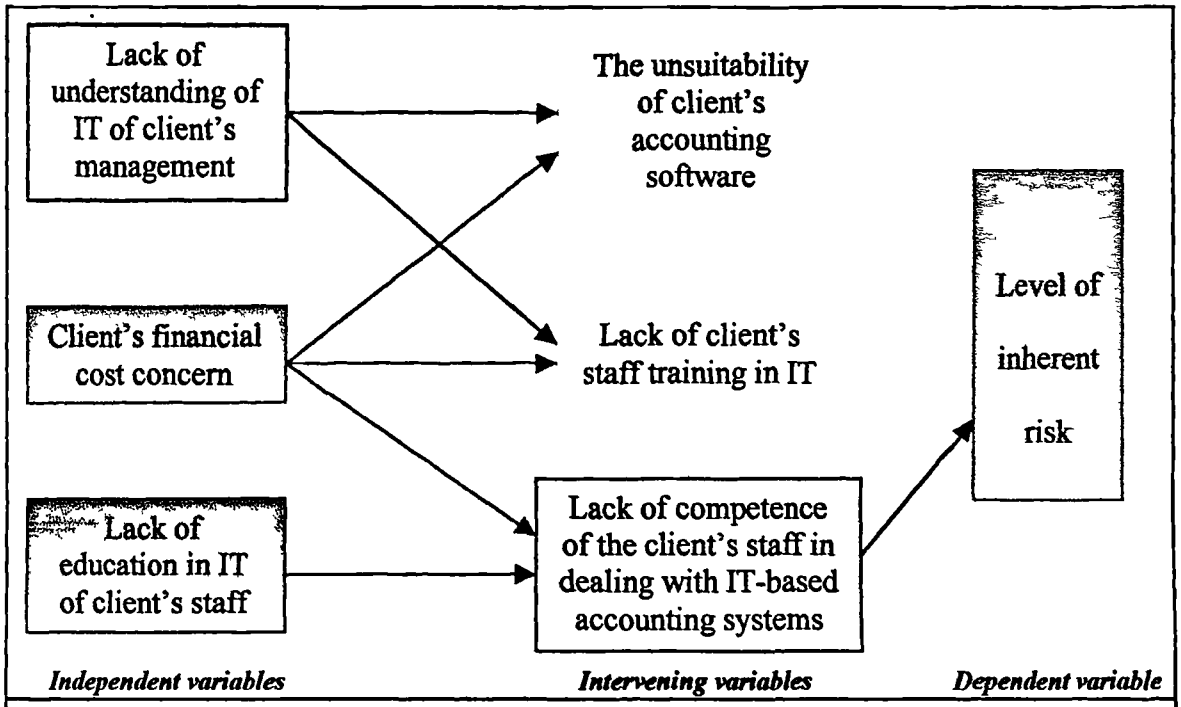

Figure 9.1 The Inherent Risk Model in an IT-based Accounting Environment

9.2.1.1 The Lack of Understanding of IT of the Client's Management

The relationships between the lack of understanding of IT of the client's management and other variables in the inherent risk model were examined in a series of Pearson correlation tests. Firstly, the relationship with the unsuitability of accounting software in the client's IT-based accounting environment was examined, and the result is presented in Table 9.1.

Table 9.1 Pearson Correlation between the Lack of Understanding of IT of the Client's Management and the Unsuitability of Accounting Software in an IT-based Accounting Environment

	The unsuitability of accounting software	
	Pearson	***Significance***
The lack of understanding of IT of the client's management	.388	.001**

** *Correlation is significant at the 0.01 level (2-tailed).*

As can be seen from Table 9.1, the Pearson correlation coefficient of .388 tends to suggest that there is a significantly positive and moderate association between the lack of understanding of IT of the client's management and the unsuitability of the client's accounting software at the 0.01 level of confidence. In addition, the coefficient of determination (r^2) indicates that 15 % of the variation of the unsuitability of the client's accounting software is explained by the lack of understanding of IT of the client's management. These results reflect participants' perceptions that a higher level of lack of understanding of IT of the client's management will be associated with a higher adoption of unsuitable or less appropriate accounting software by clients for their businesses in an IT-based accounting environment.

Secondly, its relationship with the lack of client's staff training in IT in an IT-based accounting environment was examined by using the Pearson correlation test, and the result is exhibited in Table 9.2.

Table 9.2 Pearson Correlation between the Lack of Understanding of IT of the Client's Management and the Lack of Client's Staff Training in IT in an IT-based Accounting Environment

	The lack of client's staff training in IT	
	Pearson	***Significance***
The lack of understanding of IT of the client's management	.319	.007**

** *Correlation is significant at the 0.01 level (2-tailed).*

As is apparent from the above table, the Pearson correlation coefficient of .319 seems to suggest that there is a significantly positive and moderate association between the lack of understanding of IT of the client's management and the lack of client's staff training in IT at the 0.01 level of confidence. In addition, the coefficient of determination (r^2) points out that 10 % of the variation of the lack of client's staff training in IT is explained by the lack of understanding of IT of the client's management. These findings imply that both variables are related and, in turn, a higher level of the lack of understanding of IT of the client's management will be combined with conducting fewer training sessions in IT by clients for their staff who deal with IT-based accounting systems.

In summary, it can be concluded that the lack of understanding of IT of the client's management has a significantly positive association with the unsuitability of client's accounting software and the lack of client's staff training in IT in an IT-based accounting environment. Generally speaking, the association of the lack of understanding of IT of the client's management with these variables is moderate.

9.2.1.2 The Client's Financial Cost Concern

The relationships between the client's financial cost concern and other variables in the inherent risk model were examined in series of Pearson correlation tests. Firstly, the relationship with the unsuitability of client's accounting software in an IT-based accounting environment was examined, and the result is shown in Table 9.3.

Table 9.3 Pearson Correlation between the Client's Financial Cost Concern and the Unsuitability of Client's Accounting Software in an IT-based Accounting Environment

	The unsuitability of accounting software	
	Pearson	***Significance***
The client's financial cost concern	.278	.020*

** Correlation is significant at the 0.05 level (2-tailed).*

As can be seen from Table 9.3, the Pearson correlation coefficient of .278 tends to suggest that there is a significantly positive and moderate association between the client's financial cost concern and the unsuitability of client's accounting software at the 0.05 level of confidence. In addition, the coefficient of determination (r^2) indicates that 8 % of the variation of the unsuitability of client's accounting software is explained by the client's financial cost concern. These results indicate that both variables are associated and, as a result, a higher level of a client's financial cost concern will be linked with the adoption of less appropriate accounting software by clients for their business.

Secondly, the relationship with the lack of client's staff training in IT in an IT-based accounting environment was examined, and the result is presented in Table 9.4.

Table 9.4 Pearson Correlation between the Client's Financial Cost Concern and the Lack of Client's Staff Training in IT in an IT-based Accounting Environment		
	The lack of client's staff training in IT	
	Pearson	***Significance***
The client's financial cost concern	.301	.011*

** Correlation is significant at the 0.05 level (2-tailed).*

As is apparent from the above table, the Pearson correlation coefficient of .301 seems to suggest that there is a significantly positive and moderate association between the client's financial cost concern and the lack of client's staff training in IT at the 0.05 level of confidence. Furthermore, the coefficient of determination (r^2) points out that 9% of the variation of the lack of staff training in IT is explained by the client's financial cost concern. These results indicate that both variables are related to each other and, as a result, a higher level of the client's financial cost concern will be associated with less provision of training sessions in IT or may even result in no provision of training at all by clients for their staff who deal with IT-based accounting systems and vice versa.

Finally, the relationship with the lack of competence of the client's staff in dealing with IT-based accounting systems in such an environment was examined by using the Pearson correlation test, and the result is exhibited in Table 9.5.

Table 9.5 Pearson Correlation between the Client's Financial Cost Concern and the Lack of Competence of Client's Staff in Dealing with IT based Accounting Systems in an IT-based Accounting Environment		
	The lack of competence of client's staff in dealing with IT-based accounting systems	
	Pearson	***Significance***
The client's financial cost concern	.027	.821

According to the result of the Pearson correlation test, as can be seen from the above table, there is no significant association between the client's financial cost concern and

the lack of competence of client's staff in dealing with IT-based accounting systems in such an environment. This finding is not in line with what was expected by the theoretical framework of the study. The most likely interpretation of this result is that the client's financial cost concern has an indirect association with the lack of competence of a client's staff in dealing with IT-based accounting systems in an IT-based accounting environment as will be discussed in the next section.

To summarise, it could be inferred that the client's financial cost concern has a significantly positive association with two variables. These variables are the unsuitability of client's accounting software, and the lack of client's staff training in IT. Generally speaking, the association of the client's financial cost concern with both variables is moderate.

9.2.1.3 The Lack of Education in IT of the Client's Staff

The relationship between the lack of education in IT of the client's staff and the lack of competence of client's staff in dealing with IT-based accounting systems in the inherent risk model in an IT-based accounting environment was examined by employing the Pearson correlation test, and the result is shown in Table 9.6.

Table 9.6 Pearson Correlation between the Lack of Education in IT of the Client's Staff and the Lack of Competence of Client's Staff in Dealing with IT-based Accounting Systems in an IT-based Accounting Environment

	The lack of competence of client's staff in dealing with IT-based accounting systems	
	Pearson	***Significance***
The lack of education in IT of the client's staff	.347	.003**

** *Correlation is significant at the 0.01 level (2-tailed).*

The Pearson correlation coefficient of .347, as provided in the above table, seems to suggest that there is a significantly positive and moderate association between the lack of education in IT of the client's staff and the lack of competence of client's staff in dealing with IT-based accounting systems at the 0.01 level of confidence. In addition, the coefficient of determination (r^2) points out that 12% of the variation of the lack of competence of client's staff in dealing with IT-based accounting systems is explained by the lack of education in IT of the client's staff. These findings imply that both variables are related to each other and, in turn, studying fewer, or even no courses at all in IT by client's staff in the universities or colleges will be associated with less competence in dealing with IT-based accounting systems by those staff.

9.2.1.4 The Lack of Client's Staff Training in IT

The relationship between the client's staff training in IT and the lack of competence of client's staff in dealing with IT-based accounting systems in the inherent risk model in an IT-based accounting environment was examined by using the Pearson correlation test, and the result is presented in Table 9.7.

Table 9.7 Pearson Correlation between the Lack of Client's Staff Training in IT and the Lack of Competence of Client's Staff in Dealing with IT-based Accounting Systems in an IT-based Accounting Environment

	The lack of competence of client's staff in dealing with IT-based accounting systems	
	Pearson	***Significance***
The lack of client's staff training in IT	.470	.000**

*** Correlation is significant at the 0.01 level (2-tailed).*

The Pearson correlation coefficient of .470, as presented in the above table, tends to suggest that there is a significantly positive and moderate association between the lack

of client's staff training in IT and the lack of competence of client's staff in dealing with IT-based accounting systems at the 0.01 level of confidence. In addition, the coefficient of determination (r^2) indicates that 22% of the variation of the lack of competence of client's staff in dealing with IT-based accounting systems is explained by the lack of client's staff training in IT. These results mean that both variables are associated with each other and, as a result, less provision of IT training, or even not providing training at all in IT by clients for their staff will be combined with higher levels of lack of competence in dealing with IT-based accounting systems by those staff.

9.2.1.5 The Unsuitability of Client's Accounting Software

The relationship between the unsuitability of client's accounting software and the level of inherent risk in the inherent risk model in an IT-based accounting environment was examined through the Pearson correlation test, and the result is exhibited in Table 9.8.

Table 9.8 Pearson Correlation between the Unsuitability of Client's Accounting Software and the Level of Inherent Risk in an IT-based Accounting Environment

	The level of inherent risk	
	Pearson	***Significance***
The unsuitability of client's accounting software	.353	.003**

** *Correlation is significant at the 0.01 level (2-tailed).*

As is demonstrated from the above table, the Pearson correlation coefficient of .353 seems to suggest that there is a significantly positive and moderate association between the unsuitability of client's accounting software and the level of inherent risk at the 0.01 level of confidence. Furthermore, the coefficient of determination (r^2) indicates that 12% of the variation of the level of inherent risk is explained by the unsuitability of client's accounting software. This result implies that both variables are related to each other and, in turn, higher levels of adoption of unsuitable accounting software by clients

for their business will be linked with higher levels of inherent risk in an IT-based accounting environment.

9.2.1.6 The Lack of Competence of Client's Staff in Dealing with IT-based Accounting Systems

The relationship between the lack of competence of client's staff in dealing with IT-based accounting systems and the level of inherent risk in the inherent risk model in an IT-based accounting environment was examined by using the Pearson correlation test, and the result is shown in Table 9.9.

Table 9.9 Pearson Correlation between the Lack of Competence of Client's Staff in Dealing with IT-based Accounting Systems and the Level of Inherent Risk in an IT-based Accounting Environment

	The level of inherent risk	
	Pearson	***Significance***
The lack of competence of client's staff in dealing with IT-based accounting systems	.315	.008**

** *Correlation is significant at the 0.01 level (2-tailed).*

The Pearson correlation coefficient of .315, as exhibited in the above table, tends to suggest that there is a significantly positive and moderate association between the lack of competence of client's staff in dealing with IT-based accounting systems and the level of inherent risk at the 0.01 level of confidence. In addition, the coefficient of determination (r^2) points out that 10% of the variation of the level of inherent risk is explained by the lack of competence of client's staff in dealing with IT-based accounting systems. These results imply that both variables are associated with each other and, in turn, a higher level of lack of competence in dealing with IT-based accounting systems by client's staff will be combined with a higher level of inherent risk in an IT-based accounting environment.

9.2.2 Exploring the Relationships Between Variables Related to the Control Risk Model in an IT-based Accounting Environment

The theoretical framework, discussed in Chapter Seven, proposes that there are four variables in the control risk model in an IT-based accounting environment in SA as depicted in Figure 9.2. In particular, the model embodies two independent variables (namely, the lack of understanding of IT of the client's management, and the client's financial cost concern,), in addition, one intervening variable (i.e. the weakness of client's internal control systems); and finally, one dependent variable (namely, the level of control risk). This subsection, thus, seeks to inspect these relationships by using the Pearson correlation test.

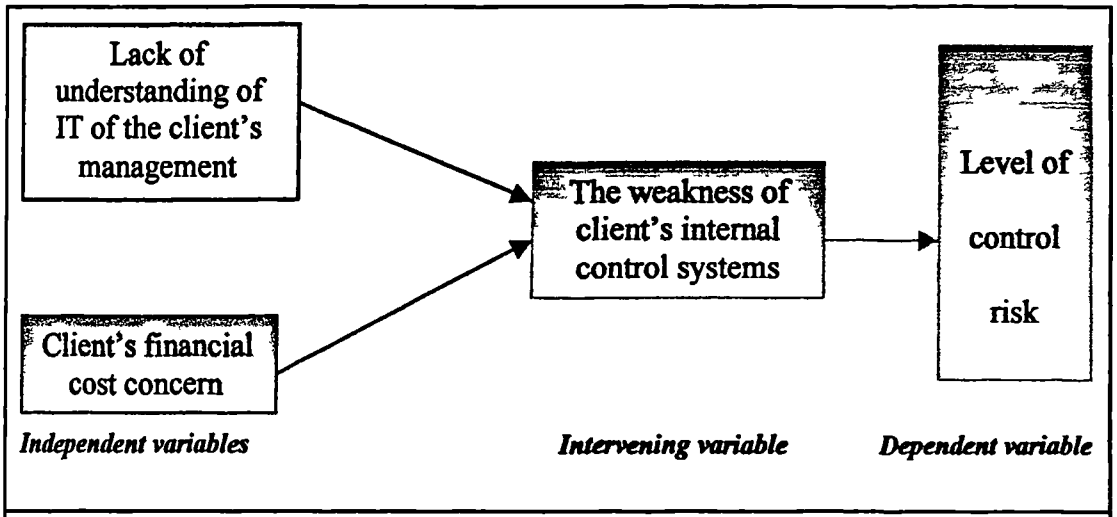

Figure 9.2 The Control Risk Model in an IT-based Accounting Environment

9.2.2.1 The Lack of Understanding of IT of the Client's Management

The relationship between the lack of understanding of IT of the client's management and the weakness of the client's internal control systems in the control risk model in an IT-based accounting environment was examined by employing the Pearson correlation test, and the result is presented in Table 9.10.

Table 9.10 Pearson Correlation between the Lack of Understanding of IT of the Client's Management and the Weakness of Client's Internal Control Systems in an IT-based Accounting Environment		
	The weakness of client's internal control systems	
	Pearson	***Significance***
The lack of understanding of IT of the client's management	.381	.001**

** *Correlation is significant at the 0.01 level (2-tailed).*

The Pearson correlation coefficient of .381, as provided in Table 9.10, tends to suggest that there is a significantly positive and moderate association between the lack of understanding of IT of the client's management and the weakness of the client's internal control systems at the 0.01 level of confidence. In addition, the coefficient of determination (r^2) indicates that 14% of the variation of the weakness of client's internal control systems is explained by the lack of understanding of IT of the client's management. These results suggest that both variables are related to each other and, in turn, higher levels of poor understanding of IT issues on the part of the client's management will be associated with a greater likelihood of applying inadequate internal controls in the client's IT-based accounting environment.

9.2.2.2 The Client's Financial Cost Concern

The relationship between the client's financial cost concern and the weakness of the client's internal control systems in the control risk model in an IT-based accounting environment was examined through the Pearson correlation test; the result is exhibited in Table 9.11.

Table 9.11 Pearson Correlation between the Client's Financial Cost Concern and the Weakness of Client's Internal Control Systems in an IT-based Accounting Environment		
	The weakness of client's internal control systems	
	Pearson	***Significance***
The client's financial cost concern	.246	.038*

** Correlation is significant at the 0.05 level (2-tailed).*

According to the Pearson correlation coefficient of .246, presented in Table 9.11, there is a significantly positive and moderate association between the client's financial cost concern and the weakness of the client's internal control systems at the 0.05 level of confidence. In addition, the coefficient of determination (r^2) indicates that 6% of the variation of the weakness of the client's internal control systems is explained by the client's financial cost concern. These results indicate that both variables are associated and, as a result, a higher level of the client's financial cost concern will be linked with the application of inadequate internal controls in the client's IT-based accounting environment and vice versa.

9.2.2.3 The Weakness of Client's Internal Control Systems

The relationship between the weakness of a client's internal control systems and the level of control risk in the control risk model in an IT-based accounting environment was examined by applying the Pearson correlation test, and the result is shown in Table 9.12.

Table 9.12 Pearson Correlation between the Weakness of Client's Internal Control Systems and the Level of Control Risk in an IT-based Accounting Environment		
	The level of control risk	
	Pearson	***Significance***
The weakness of client's internal control systems	.332	.005**

** Correlation is significant at the 0.01 level (2-tailed).*

The Pearson correlation coefficient of .332, provided in the above table, seems to suggest that there is a significantly positive and moderate association between the weakness of the client's internal control systems and the level of control risk at the 0.01 level of confidence. In addition, the coefficient of determination (r^2) indicates that 11% of the variation of the level of control risk is explained by the weakness of the client's internal control systems. These results imply that both variables are associated with each other and, as a result, a higher level of applying inadequate internal controls in the client's IT-based accounting environment will be combined with a higher level of control risk.

9.2.3 Exploring the Relationships Between Variables Related to the Detection Risk Model in an IT-based Accounting Environment

The theoretical framework, discussed in Chapter Seven, suggests that there are seven variables in the detection risk model in an IT-based accounting environment in SA as depicted in Figure 9.3. The model includes three independent variables, three intervening variables, and one dependent variable. Their details are as follows. Firstly, the independent variables are the inappropriateness of the Saudi audit standard to the IT-based accounting environment, the audit firm's financial cost concern, and the lack of education of auditors in IT. Secondly, the intervening variables are the use of the auditing around the computer approach, the lack of competence of auditors in auditing IT-based accounting systems, and the lack of IT training for auditors. Finally, the dependent variable is the level of detection risk. The objective of this subsection, thus, is to examine these relationships by employing the Pearson correlation test.

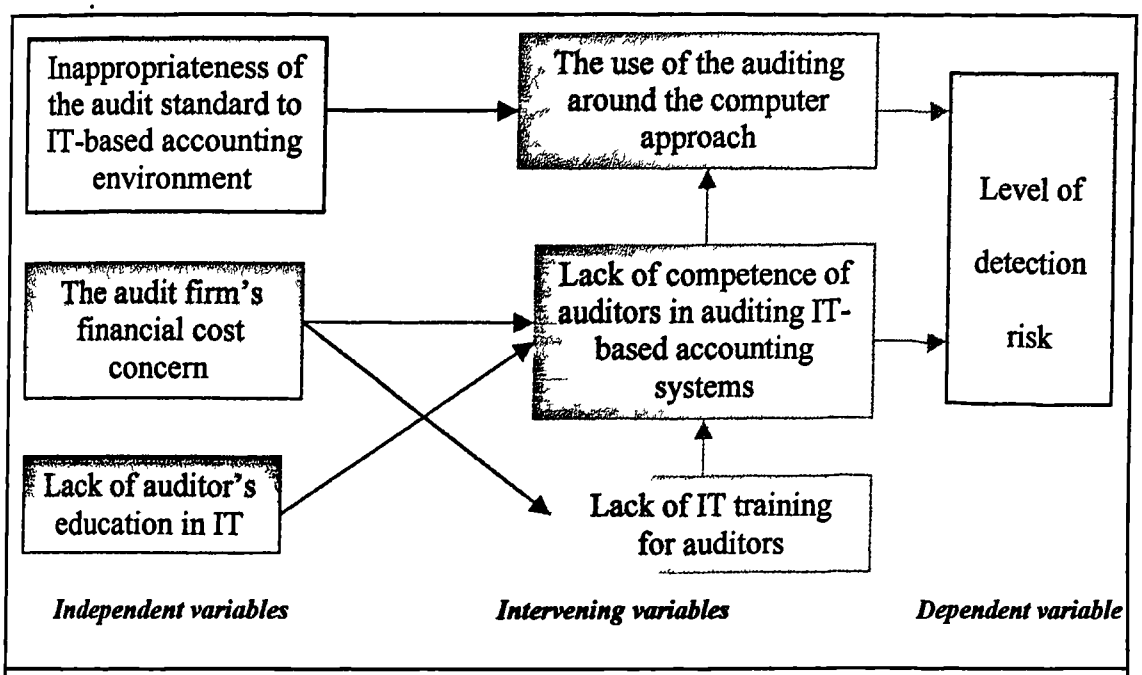

Figure 9.3 The Detection Risk Model in an IT-based Accounting Environment

9.2.3.1 The Inappropriateness of the Saudi Audit Standard to the IT-based Accounting Environment

The relationship between the inappropriateness of the Saudi audit standard to the IT-based accounting environment and the use of the auditing around the computer approach in the detection risk model in an IT-based accounting environment was examined by using the Pearson correlation test, and the result is presented in Table 9.13.

Table 9.13 Pearson Correlation between the Inappropriateness of the Saudi Audit Standard and the Use of the Auditing Around the Computer Approach in an IT-based Accounting Environment

	The use of the auditing around the computer approach	
	Pearson	***Significance***
The inappropriateness of the audit standard to the IT-based accounting environment	.314	.009**

** *Correlation is significant at the 0.01 level (2-tailed).*

As is demonstrated from the above table, the Pearson correlation coefficient of .314 tends to suggest that there is a significantly positive and moderate association between the inappropriateness of the audit standard to the IT-based accounting environment and the use of the auditing around the computer approach at the 0.01 level of confidence. Moreover, the coefficient of determination (r^2) implies that 10% of the variation of the use of the auditing around the computer approach is explained by the inappropriateness of the audit standard to the IT-based accounting environment. These findings indicate that both variables are related to each other and, in turn, the more inappropriate the audit standard to the IT-based accounting environment would be associated with a higher use of the auditing around the computer approach by audit firms in an IT-based accounting environment.

9.2.3.2 The Audit Firm's Financial Cost Concern

The relationships between the audit firm's financial cost concern and other variables in the detection risk model in an IT-based accounting environment were examined in a series of Pearson correlation tests. Firstly, the relationship with the lack of competence of auditors in auditing IT-based accounting systems was examined, and the result is exhibited in Table 9.14.

Table 9.14 Pearson Correlation between the Audit Firm's Financial Cost Concern and the Lack of Competence of Auditors in an IT-based Accounting Environment

	The lack of competence of auditors in auditing IT-based accounting systems	
	Pearson	***Significance***
The audit firm's financial cost concern	.373	.002**

** *Correlation is significant at the 0.01 level (2-tailed).*

The Pearson correlation coefficient of .373, provided in the above table, seems to suggest that there is a significantly positive and moderate association between the audit firm's financial cost concern and the lack of competence of auditors in auditing IT-based accounting systems at the 0.01 level of confidence. In addition, the coefficient of determination (r^2) indicates that 14% of the variation of the lack of competence of auditors in auditing IT-based accounting systems is explained by the audit firm's financial cost concern. These results imply that both variables are associated with each other and, as a result, a higher level of an audit firm's financial cost concern will be combined with a higher level of recruitment of less competent auditors in auditing IT-based accounting systems.

Secondly, the relationship with the lack of provision of IT training for auditors who are dealing with IT-based accounting systems was examined, and the result is presented in Table 9.15.

Table 9.15 Pearson Correlation between the Audit Firm's Financial Cost Concern and the Lack of IT Training for Auditors in an IT-based Accounting Environment

	The lack of IT training for auditors	
	Pearson	***Significance***
The audit firm's financial cost concern	.320	.007**

** *Correlation is significant at the 0.01 level (2-tailed).*

As is apparent from the above table, the Pearson correlation coefficient of .320 seems to suggest that there is a significantly positive and moderate association between the audit firm's financial cost concern and the lack of provision of IT training for their staff who are dealing with IT-based accounting systems at the 0.01 level of confidence. In addition, the coefficient of determination (r^2) points out that 10% of the variation of the lack of IT training for auditors who are dealing with IT-based accounting systems is

explained by the audit firm's financial cost concern. These results indicate that both variables are related to each other and, as a result, a higher level of an audit firm's financial cost concern will be combined with less provision or even a total lack of provision of training sessions in IT by audit firms for their staff who audit IT-based accounting systems.

In summary, it could be concluded that the audit firm's financial cost concern has a significantly positive association with the lack of competence of their auditors in auditing IT-based accounting systems and also the lack of providing IT training for their staff who deal with such systems. Generally speaking, the association of the audit firm's financial cost concern with both variables is moderate.

9.2.3.3 The Lack of Education in IT of Auditors

The relationship between the lack of education in IT of auditors and the lack of competence of auditors in auditing IT-based accounting systems in the detection risk model in an IT-based accounting environment was examined through the Pearson correlation test, and the result is shown in Table 9.16.

Table 9.16 Pearson Correlation between the Lack of Education of Auditors in IT and the Lack of Competence of Auditors in an IT-based Accounting Environment

	The lack of competence of auditors in auditing IT-based accounting systems	
	Pearson	***Significance***
The lack of education in IT of auditors	.275	.023*

* *Correlation is significant at the 0.05 level (2-tailed).*

The Pearson correlation coefficient of .275, as provided in the above table, seems to suggest that there is a significantly positive and moderate association between the lack of education in IT of auditors and their lack of competence in auditing IT-based

accounting systems at the 0.05 level of confidence. Moreover, the coefficient of determination (r^2) indicates that 7% of the variation of the lack of competence of auditors in auditing IT-based accounting systems is explained by their lack of education in IT. These findings imply that both variables are linked to each other and, in turn, having fewer, or even having no courses at all in IT in the universities or colleges for auditors will be associated with lower levels of competence in them dealing with IT-based accounting systems.

9.2.3.4 The Lack of IT Training for Auditors

The relationship between the lack of IT training for auditors and the lack of competence of auditors in auditing IT-based accounting systems in the detection risk model in an IT-based accounting environment was examined by employing the Pearson correlation test, and the result is illustrated in Table 9.17.

Table 9.17 Pearson Correlation between the Lack of IT Training for Auditors and the Lack of Competence of Auditors in an IT-based Accounting Environment

	The lack of competence of auditors in auditing IT-based accounting systems	
	Pearson	***Significance***
The lack of IT training for auditors	.383	.001**

** *Correlation is significant at the 0.01 level (2-tailed).*

The Pearson correlation coefficient of .383, as can be seen from the above table, tends to suggest that there is a significantly positive and moderate association between the lack of IT training for auditors and the lack of competence of auditors in auditing IT-based accounting systems at the 0.01 level of confidence. Moreover, the coefficient of determination (r^2) implies that 15 % of the variation of the lack of competence of auditors in auditing IT-based accounting systems is explained by the lack of provision of IT training for them. These results indicate that both variables are related to each

other and, as a result, less provision of IT training by audit firms for their staff who deal with IT-based accounting systems will be combined with poorer levels of competence in auditing these systems by such staff.

9.2.3.5 The Lack of Competence of Auditors in Auditing IT-based Accounting Systems

The relationships between the lack of competence of auditors in auditing IT-based accounting systems and other variables in the detection risk model in an IT-based accounting environment were examined in a series of Pearson correlation tests. Firstly, the relationship with the use of the auditing around the computer approach was examined, and the result is exhibited in Table 9.18.

Table 9.18 Pearson Correlation between the Lack of Competence of Auditors and the Use of the Auditing Around the Computer Approach in an IT-based Accounting Environment

	The auditing around the computer approach	
	Pearson	***Significance***
The lack of competence of auditors in auditing IT-based accounting systems	.306	.011*

** Correlation is significant at the 0.05 level (2-tailed).*

As is apparent from the above table, the Pearson correlation coefficient of .306 seems to suggest that there is a significantly positive and moderate association between the lack of competence of auditors in auditing IT-based accounting systems and the use of the auditing around the computer approach at the 0.05 level of confidence. In addition, the coefficient of determination (r^2) points out that 9 % of the variation of the use of the auditing around the computer approach is explained by the lack of competence of auditors in auditing IT-based accounting systems. These findings imply that both variables are associated with each other and, in turn, higher levels of lack of competence

of auditors in auditing IT-based accounting systems will be combined with a higher level of use of the auditing around the computer approach by their firms when they audit in such an environment.

Secondly, the relationship with the level of detection risk in an IT-based accounting environment was examined, and the result is presented in Table 9.19.

Table 9.19 Pearson Correlation between the Lack of Competence of Auditors and the Level of Detection Risk in an IT-based Accounting Environment

	The level of detection risk	
	Pearson	***Significance***
The lack of competence of auditors in auditing IT-based accounting systems	.319	.008**

** *Correlation is significant at the 0.01 level (2-tailed).*

The Pearson correlation coefficient of .319, as provided in the above table, tends to suggest that there is a significantly positive and moderate association between the lack of competence of auditors in auditing IT-based accounting systems and the level of detection risk at the 0.01 level of confidence. Furthermore, the coefficient of determination (r^2) implies that 10 % of the variation of the level of detection risk is explained by the lack of competence of auditors in auditing IT-based accounting systems. These results indicate that both variables are related to each other and, as a result, a higher level of lack of competence of auditors in auditing IT-based accounting systems will be combined with a higher level of detection risk in such an environment.

In summary, it could be inferred that the lack of competence of auditors in auditing IT-based accounting systems has a significantly positive association with both the above variables. Generally speaking, the association of the lack of competence of auditors in auditing IT-based accounting systems with the use of the auditing around the computer

approach and the level of detection risk is moderate.

9.2.3.6 The Use of the Auditing Around the Computer Approach

The relationship between the use of the auditing around the computer approach and the level of detection risk in the detection risk model in an IT-based accounting environment was examined by using the Pearson correlation test, and the result is shown in Table 9.20.

Table 9.20 Pearson Correlation between the Use of the Auditing Around the Computer Approach and the Level of Detection Risk in an IT-based Accounting Environment

	The level of detection risk	
	Pearson	***Significance***
The use of the auditing around the computer approach	.323	.006**

** *Correlation is significant at the 0.01 level (2-tailed).*

As is demonstrated from the above table, the Pearson correlation coefficient of .323 tends to suggest that there is a significantly positive and moderate association between the use of the auditing around the computer approach and the level of detection risk at the 0.01 level of confidence. Moreover, the coefficient of determination (r^2) points out that 10 % of the variation of the level of detection risk is explained by the use of the auditing around the computer approach. These findings imply that both variables are linked to each other and, in turn, a higher use of the auditing around the computer approach will be associated with a higher level of detection risk.

In summary, this section has revealed the bivariate correlations between the variables of the research using the Pearson correlation test. Investigating the plausibility of the research model via path analysis will be the subject of the next section.

9.3 Path Analysis

The technique of path analysis using least squares multiple regression[1] was used to test the tenability of the proposed model and to assess the pattern of linkages between predictor variables and the level of audit risk. Path analysis was selected because it allows the estimation of the magnitude of both the direct and indirect contributions of factors taken as causes on factors taken as effects, as well as the residual [or unexplained] components of variables, in the context of a model with variables arranged in a known temporal sequence (Hair et al., 1995; Kline, 1998; Bryaman and Cramer, 2001)[2]. In addition, with path analysis, the effect of one independent (or exogenous) variable on a dependent (or endogenous) variable is examined together with the effects of the other independent variables. Although path analysis cannot establish causality, it provides quantitative estimates of the causal connections between sets of variables (Bryaman and Cramer, 2001; Maruyama, 1998; Li, 1975).

This section aims to perform path analyses for the inherent risk model, the control risk model and the detection risk model in an IT-based accounting environment in SA. In

[1] It is worth mentioning at this point that the parameters of the recursive path models can be estimated either by multiple regression or with procedures that are available in model-fitting programs (the most widely used among the latter is the maximum likelihood {ML}) (Maruyama, 1998; Kline, 1998). Generally speaking, estimates yielded by multiple regression and ML estimation for recursive models are virtually identical (Kline, 1998). In particular, the regression technique has been shown to produce the "best" way of estimating the paths with over-identified recursive models (Maruyama, 1998). However, a potential drawback of ML estimation is that iterative estimation can fail to converge if the computer is provided with inaccurate initial estimates (starting values) of model parameters (Kline, 1998). Another drawback of model fitting programs is that they usually require users to generate a great deal of rather arcane code for each analysis; this is time-consuming, tedious and highly error-prone process (Kline, 1998).

[2] The ability of path analysis to estimate an indirect effect as well as a direct effect is the main feature which differentiates this statistical technique from other standard techniques such as multiple regression which permits specification only of direct effects on a single outcome (Hoyle, 1995; Maruyama, 1998). As Bollen (1989, P.38) stated "*If we ignore the indirect effects that a variable may have through other variables, we may be grossly off in the assessment of its overall effect*".

each model, care was taken to minimise violations of the assumptions underlying path analysis such as the causal flow is one-way, all relations are linear, there is no multicollinearity among independent variables, and the residuals (or disturbances) are uncorrelated with each other (Billings and Wroten, 1978; James, 1980). In addition, and following the logic of Heise (1969) and MacCallum (1986), the non-significant ($P > .05$) exogenous variables will be excluded from further analysis in each model in order to trim the model and make it more parsimonious. Separate subsections are specified below for each model or component of audit risk in an IT-based accounting environment.

9.3.1 Variables Affecting the Level of Inherent Risk in an IT-based Accounting Environment

It was reported in Subsection 9.2.1 the variables that are expected to have an influence on the level of inherent risk in an IT-based accounting environment in SA; these were also depicted in Figure 9.1. In other words, Figure 9.1 is the path diagram for the inherent risk model in an IT-based accounting environment. However, it is worth noting that the assumptions underlying the path analysis were achieved before proceeding to estimate path coefficients (i.e. standardised regression coefficients) in the inherent risk model. For the purpose of checking these assumptions within the inherent risk model, the following steps were performed. Firstly, tolerance statistic tests were carried out in order to spot if there was any possibility of multicollinearity among independent variables. The tolerances for the lack of understanding of IT of the client's management, the client's financial cost concern, and the lack of education in IT of the client's staff were .786, .800, and .840 respectively, suggesting that multicollinearity is unlikely

because the tolerance figures are far from zero[3]. Secondly, scattergrams were plotted to test for possible non-linearity of the relationships of exogenous variables with endogenous variables. A visual inspection of the plots suggested that there are linear relationships among them. Finally, the residuals of the endogenous variables were tested for autocorrelation using the Durbin-Watson test[4]. The Durbin-Watson statistic was 2.26, indicating that the residuals are not correlated among themselves.

The regression results and the path coefficients (i.e. standardised regression coefficient {Beta}) representing the direct effects of the exogenous variables on the endogenous variables in the inherent risk model are exhibited in Table 9.21.

Table 9.21 Summary of Multiple Regression Results: Direct Effect of the Exogenous Variables on the Endogenous Variables in the Inherent Risk Model

Exogenous Variables	**Endogenous Variables**			
	The unsuitability of client's accounting software	The lack of client's staff training in IT	The lack of competence of client's staff in IT	The level of inherent risk
The lack of understanding of IT of the client's management	.370**	.318**		-.079
The client's financial cost concern	.251*	.301**	-.155	.148
The lack of education in IT of the client's staff			.286**	-.087
The unsuitability of client's accounting software				.296*
The lack of client's staff training in IT			.465**	.017
The lack of competence of client's staff in dealing with IT-based accounting systems				.276*
R^2	*.214***	*.192***	*.314***	*.214**

*** P < 0.01 & * P < 0.05*

[3] For more details about this statistical test, see, for example, Bryaman and Cramer (2001).

[4] It is usually denoted by ***d;*** and it ranges from 0 to 4. The closer ***d*** is to 2, the former is the evidence that there is no autocorrelation present. For more details about this statistical test, see, for example, Dillon and Goldstein (1984); Kervin (1992).

The data presented in Table 9.21 revealed that the lack of understanding of IT of the client's management and the client's financial cost concern explained 21.4 % of the variance in the unsuitability of client's accounting software ($p < .01$). In addition, both of these variables explained 19.2 % of the variance in the lack of client's staff training in IT ($p <. 01$). Moreover, the lack of education in IT of the client's staff and the lack of client's staff training in IT explained 31.4 % of the variance in the lack of competence of client's staff in dealing with IT-based accounting systems ($p < .01$). Furthermore, the unsuitability of client's accounting software and the lack of competence of client's staff in dealing with IT-based accounting systems explained 21.4 % of the variance in the level of inherent risk ($p <. 05$). Finally, it showed that 8 out of the 13 direct paths tested in the model were significant at the .05 level or better. Figure 9.4 illustrates the network of relationships among the variables for which significant path coefficients were found.

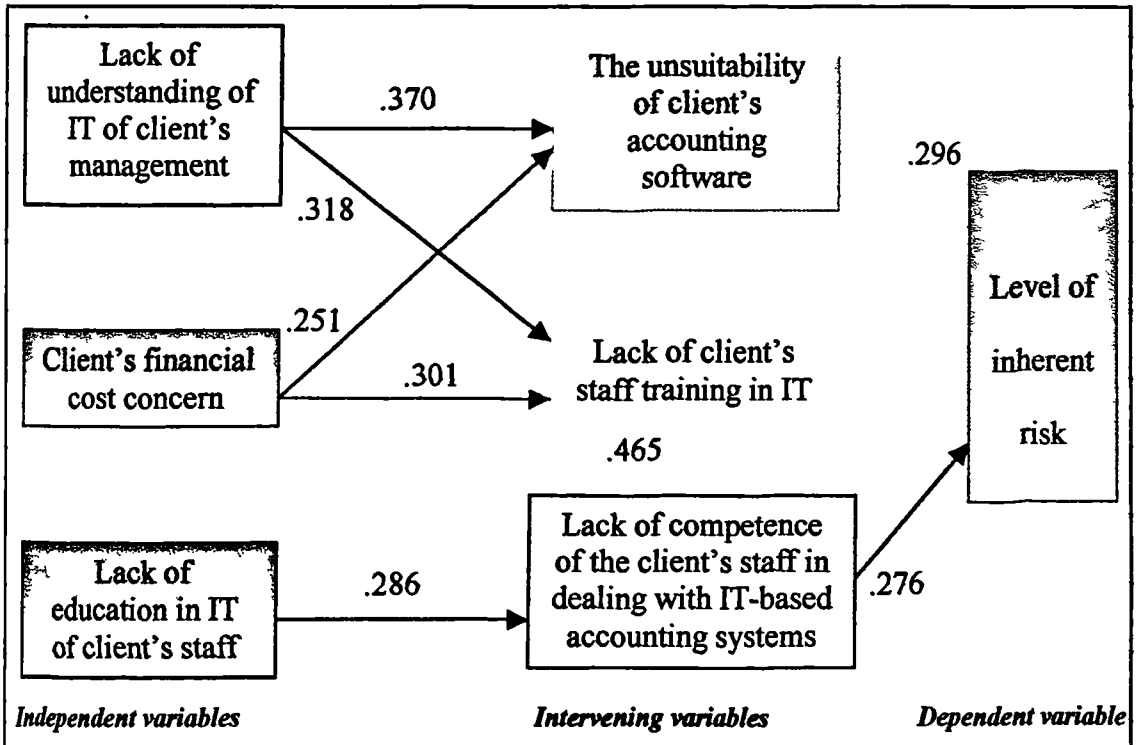

Figure 9.4 Path Coefficients for the Inherent Risk Model in an IT-based Accounting Environment

It appears from the data exhibited in Figure 9.4, that the lack of understanding of IT of the client's management, and the client's financial cost concern have significant direct and positive effects on the unsuitability of client's accounting software. Although both of these factors contribute moderately to increasing the unsuitability of client's accounting software in an IT-based accounting environment, the lack of understanding of IT of the client's management has a stronger impact on the unsuitability of client's accounting software than another variable (Beta = .370, $p < .01$; as opposed to Beta = .251, $p < .05$). These results suggest that the higher the level of the lack of understanding of IT of the client's management and/or the higher the client's financial cost concern, the higher the possibility of adopting unsuitable accounting software by the clients for their businesses. In addition, these two variables have significantly direct and positive effects on the lack of client's staff training in IT. Though both of them contribute moderately to increasing the lack of provision of IT training by clients for their staff who deal with IT-based accounting systems, the lack of understanding of IT of the client's management has a stronger impact on the lack of provision of IT training for a client's staff than the client's financial cost concern (Beta = .318, $p < .01$ in contrast to Beta = .301, $p < .05$). These findings imply that the higher the level of the lack of understanding of IT of the client's management, and/or the higher the level of the client's financial cost concern, the more likely is the possibility of not providing IT training by clients for their staff who deal with IT-based accounting systems. Furthermore, the lack of education in IT of the client's staff and the lack of client's staff training in IT have significant direct and positive effects on the lack of competence of the client's staff in dealing with IT-based accounting systems. Although both of these variables contribute moderately to increasing the lack of competence of client's staff in such an environment, the lack of client's staff training in IT has a stronger impact on the

lack of competence of client's staff in IT than the lack of education in IT of the client's staff (Beta = .465, $p < .05$ compared with Beta = .286, $p < .01$). These results suggest that studying fewer, or even no courses in IT at all in the universities or colleges on the part of client's staff, and/or less provision of IT training by clients for their staff, the lower the competence or ability the client's staff will have in dealing with IT-based accounting systems. In contrast, and as opposed to what was expected by the theoretical framework of the study, no significant direct contribution was found from the client's financial cost concern to the lack of competence of client's staff in dealing with IT-based accounting systems. However, the client's financial cost concern contributed indirectly to increasing the lack of competence of the client's staff in dealing with IT-based accounting systems through the mediation of the lack of provision of IT training by clients for their staff who deal with IT-based accounting systems. Finally, only the unsuitability of client's accounting software and the lack of competence of the client's staff in dealing with IT-based accounting systems have significantly direct and positive effects on the level of inherent risk (i.e. the target variable). Although both of these variables contribute moderately to increasing the level of inherent risk, the unsuitability of client's accounting software has a stronger impact on the level of inherent risk than the lack of competence of the client's staff in dealing with IT-based accounting systems (Beta = .296, $p < .05$; as opposed to Beta = .276, $p < .05$, respectively). These results indicate that the higher the adoption of unsuitable accounting software by clients for their businesses, and/or the higher the levels of lack of competence of client's staff in dealing with IT-based accounting systems, the higher the level of inherent risk in an IT-based accounting environment. However, a lack of understanding of IT of the client's management, and the client's financial cost concern contribute indirectly to increasing the level of inherent risk through the mediation of the unsuitability of the client's

accounting software, the lack of client's staff training in IT, and the lack of competence of client's staff in IT; while the lack of education in IT of client's staff contributes indirectly to increasing the level of inherent risk through the mediation of the lack of competence of the client's staff in dealing with IT-based accounting systems only. Examinations of the indirect effects of these independent variables on the target or dependent variable (i.e. the level of inherent risk) are shown in Table 9.22. As demonstrated from the figures in Table 9.22, the lack of understanding of IT of the client's management is the strongest predictor of the level of inherent risk in an IT-based accounting environment in SA, followed by the client's financial cost concern, and the lack of education in IT of the client's staff (the total indirect effects of the variables mentioned above are .149, .112, and .079 respectively on the level of inherent risk)[5]. Thus, it could be concluded that the roles of the unsuitability of the client's accounting software, the lack of client's staff training in IT, and the lack of competence of client's staff in dealing with IT-based accounting systems as intervening variables were confirmed by finding that independent variables influence the dependent variable (i.e. the level of inherent risk) indirectly through their effects (i.e. independent variables) on the intervening variables.

[5] It was mentioned above that these independent variables have only indirect effects on the dependent variable (i.e. level of inherent risk). Thus, the indirect effect of each independent variable will be its total effect on the dependent variable.

Table 9.22 The Calculation of the Indirect Effects of the Independent Variables on the Dependent Variable in the Inherent Risk Model	
Independent variables	**The dependent variable** *Level of inherent risk*
The lack of understanding of IT of the client's management	
• Indirect effect via the unsuitability of accounting software	.109
• Indirect effect via the lack of client's staff training in IT and the lack of competence of client's staff in dealing with IT-based accounting systems	.040
Total indirect effect	***.149***
The client's financial cost concern	
• Indirect effect via the unsuitability of accounting software	.074
• Indirect effect via the lack of client's staff training in IT and the lack of competence of client's staff in dealing with IT-based accounting systems	.038
Total indirect effect	***.112***
The lack of education in IT of the client's staff	
• Indirect effect via the lack of competence of client's staff in dealing with IT	.079
Total indirect effect	***.079***

9.3.2 Variables Affecting the Level of Control Risk in an IT-based Accounting Environment

Subsection 9.2.2 highlighted the variables that are expected to have an influence on the level of control risk in an IT-based accounting environment in SA; they were also depicted in Figure 9.2. In other words, Figure 9.2 is the path diagram for the control risk model in an IT-based accounting environment. However, in order to estimate path coefficients (i.e. standardised regression coefficients) in the control risk model, it is preferable first to check how the assumptions underlying the path analysis were achieved. For the purpose of examining these assumptions within the control risk

model, the following steps were carried out. In the first instance, tolerance statistic tests were performed in order to ascertain whether any possibility of multicollinearity existed among the independent variables. The tolerances for the following: the lack of understanding of IT of the client's management, and the client's financial concern were .846 and .930 respectively. This suggests that multicollinearity is unlikely because the tolerance figures are far from zero. Scattergrams were also plotted to test for possible non-linearity of the relationships of exogenous variables with endogenous variables. A visual inspection of the plots indicated that there are linear relationships among them. In a final stage, the residuals of the endogenous variables were also tested using the Durbin-Watson test for autocorrelation. The results of this test yielded a statistic of 2.14. This indicates that the residuals are not correlated among themselves.

The regression results and the path coefficients representing the direct effects of the exogenous variables on the endogenous variables in the control risk model are exhibited in Table 9.23.

Table 9.23 Summary of Multiple Regression Results: Direct Effect of the Exogenous Variables on the Endogenous Variables in the Control Risk Model

Exogenous variables	**Endogenous variables**	
	The weakness of client's internal control systems	The level of control risk
The lack of understanding of IT of the client's management	.380**	.010
The client's financial cost concern	.245*	.229
The weakness of client's internal control systems		.272*
R^2	*.205***	*.159**

*** P < 0.01 & * P < 0.05*

According to the figures exhibited in Table 9.23, the lack of understanding of IT of the client's management and the client's financial cost concern explained 20.5% of the variance in the weakness of client's internal control systems ($p < .01$). In addition, the weakness of client's internal control systems explained 15.9% of the variance in the level of control risk ($p < .05$). Finally, the data in the above table revealed that 3 out of the 5 direct paths tested in the model were significant at the .05 level or better. The network of relationships among the variables for which significant path coefficients were found is presented in Figure 9.5.

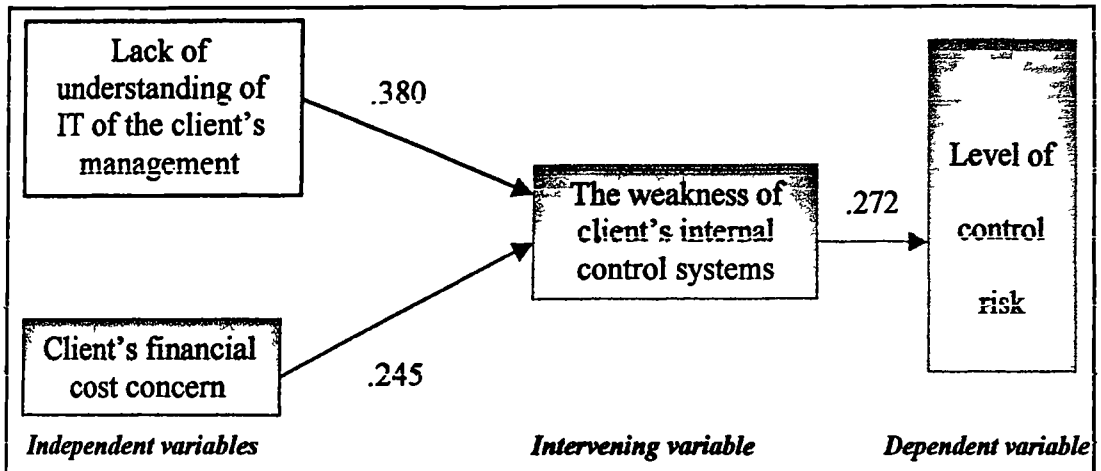

Figure 9.5 Path Coefficients for the Control Risk Model in an IT-based Accounting Environment

As is evident from Figure 9.5, the lack of understanding of IT of the client's management, and the client's financial cost concerns have significant direct and positive effects on the weakness of their internal control systems in an IT-based accounting environment. Although both of these variables contribute to increasing the weakness of clients' internal control systems, the lack of understanding of IT of the client's management has a stronger impact on the weakness of clients' internal control systems in an IT-based accounting environment than the client's financial cost concerns (Beta =

.380, $p < .01$ as opposed to Beta = .245, $p < .05$). These findings imply that the higher the level of lack of understanding of IT of the client's management, and/or the client's financial cost concern, the higher the possibility of applying inadequate or insufficient internal control systems in the client's IT-based accounting environment. In addition, only the weakness of the client's internal control systems has a significantly direct and positive effect on the level of control risk (i.e. the target variable). This variable contributes moderately to increasing the level of control risk (Beta = .272, $p < .05$). This result indicates that the higher the level of application of inadequate or insufficient internal control systems in the client's IT-based accounting environment, the higher the level of control risk in an IT-based accounting environment. It can be inferred, therefore, that the lack of understanding of IT of the client's management, and the client's financial cost concern contribute indirectly to increasing the level of control risk through the mediation of the weakness of the client's internal control systems. Examinations of the indirect effects of these independent variables on the dependent or target variable (i.e. the level of control risk) are exhibited in Table 9.24. As can be seen from the figures in Table 9.24, the lack of understanding of IT of the client's management is the strongest predictor of the level of control risk in an IT-based accounting environment in SA, followed by the client's financial cost concern (the total indirect effects of the variables mentioned above are .103, and .066 respectively on the level of control risk)[6]. Thus, it could be concluded that the role of the weakness of a client's internal control systems as an intervening variable was confirmed by finding that independent variables influence the dependent variable (i.e. the level of the control

[6] It was mentioned above that these independent variables have only indirect effects on the dependent variable (i.e. level of control risk). Thus, the indirect effect of each independent variable will be its total effect on the dependent variable.

risk) indirectly through their effects (i.e. the independent variables) on the intervening variable.

Table 9.24 The Calculation of the Indirect Effects of the Independent Variables on the Dependent Variable in the Control Risk Model	
Independent variables	**The dependent variable**
	Level of control risk
The lack of understanding of IT of the client's management	
• Indirect effect via the weakness of the client's internal control systems	.103
Total indirect effect	***.103***
The client's financial cost concern	
• Indirect effect via the weakness of the client's internal control systems	.066
Total indirect effect	***.066***

9.3.3 Variables Affecting the Level of Detection Risk in an IT-based Accounting Environment

It was reported in Subsection 9.2.3 the variables that are expected to have an influence on the level of detection risk in an IT-based accounting environment in SA; these were also depicted in Figure 9.3. In other words, Figure 9.3 is the path diagram for the detection risk model in an IT-based accounting environment. However, it is worth checking how the assumptions underlying path analysis were achieved before

proceeding to estimate path coefficients in the detection risk model. For the purpose of checking these assumptions within the detection risk model, the following steps were performed. Firstly, tolerance statistic tests were carried out in order to examine if there was any possibility of multicollinearity among independent variables. The tolerances for the inappropriateness of the Saudi audit standard for an IT-based accounting environment, the audit firm's financial cost concern, and the lack of auditors' education in IT are .893, .810, and .921 respectively. These figures propose that multicollinearity is unlikely because they are far from zero. Secondly, in order to test for possible non-linearity of the relationships of exogenous variables with endogenous variables, scattergrams were plotted. A visual inspection of the plots indicated that there are linear relationships among them. Finally, the Durbin-Watson test was employed to check for autocorrelation of the residuals of the endogenous variables. The results of the Durbin-Watson statistic test was 1.75, indicating the residuals are not correlated among themselves.

The regression results and the path coefficients representing the direct effects of the exogenous variables on the endogenous variables in the detection risk model are exhibited in Table 9.25.

Table 9.25 Summary of Multiple Regression Results: Direct Effect of the Exogenous Variables on the Endogenous Variables in the Detection Risk Model

Exogenous variables	Endogenous variables			
	The use of the auditing around the computer approach	The lack of competence of auditors in auditing IT-based accounting systems	The lack of IT training for auditors	The level of detection risk
The inappropriateness of the Saudi audit standard	.257*			.070
The audit firm's financial cost concern		.283*	.320**	-.091
The lack of auditors' education in IT		.219*		.189
The use of the auditing around the computer approach				.338**
The lack of competence of auditors in auditing IT-based accounting systems	.257*			.297*
The lack of IT training for auditors		.276*		.002
R^2	*.164***	*.276***	*.102***	*.339***

*** P < 0.01 & * P < 0.05*

The data shown in Table 9.25 revealed that the inappropriateness of the Saudi audit standard and the lack of competence of auditors in auditing IT-based accounting systems explained 16.4 % of the variance in the use of the auditing around the computer approach (p < .01). Further, the audit firm's financial cost concern, the lack of auditors' education in IT, and the lack of IT training for auditors explained 27.6 % of the variance in the lack of competence of auditors in auditing IT-based accounting systems (p <. 01). In addition, the audit firm's financial cost concern explained 10.2 % of the variance of the lack of IT training for auditors (p < .01). Furthermore, the use of the auditing around

the computer approach and the lack of competence of auditors in auditing IT-based accounting systems explained 33.9 % of the variance in the level of detection risk ($p < .01$). Finally, it revealed that 8 out of the 12 direct paths tested in the model were significant at the .05 level or better. Figure 9.6 illustrates the network of relationships among the variables for which significant path coefficients were found.

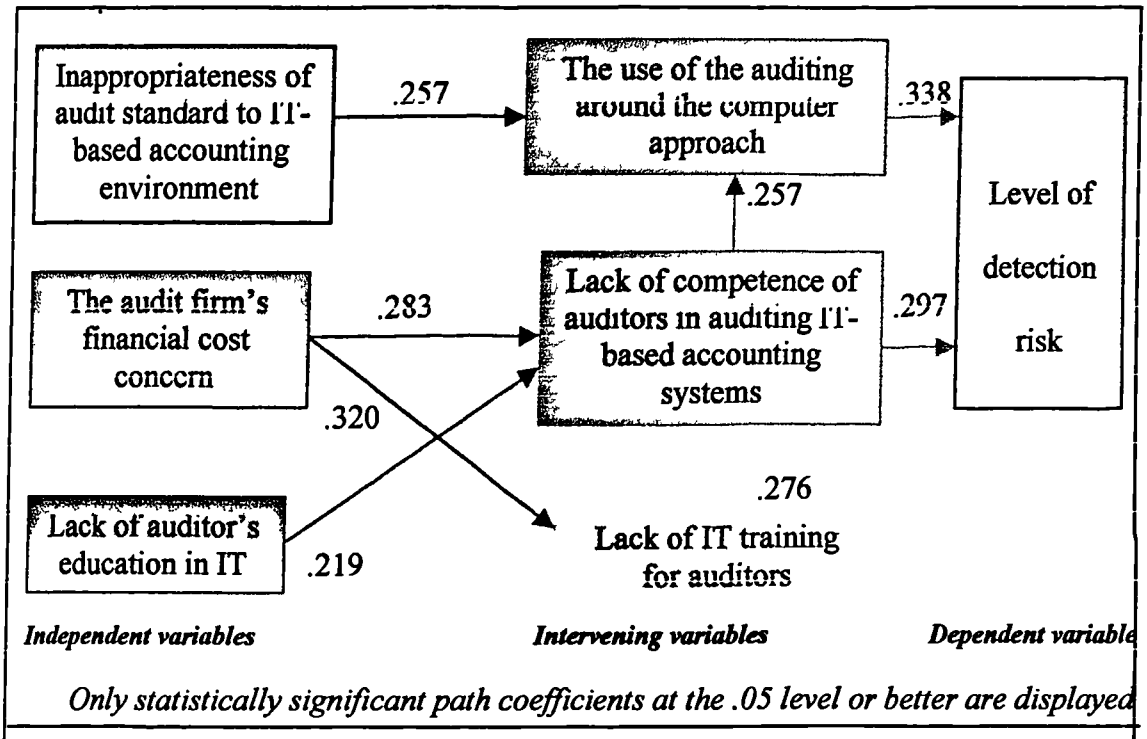

Figure 9.6 Path Coefficients for the Detection Risk Model in an IT-based Accounting Environment

As is apparent from the data in Figure 9.6, the inappropriateness of the Saudi audit standard in an IT-based accounting environment and the lack of competence of auditors in auditing IT-based accounting systems have significant direct and positive effects on the use of the auditing around the computer approach in such an environment. Both of these variables contribute moderately to increasing the use of the auditing around the computer approach by audit firms when they audit IT-based accounting systems, and with equal impact (Beta = .257, $p < .05$ for both of them). These results reveal that the

higher the level of inappropriateness of the audit standard to the IT-based accounting environment, and/or the higher the level of the lack of competence of auditors in auditing IT-based accounting systems, the higher the use of the auditing around the computer approach by audit firms. In addition, the audit firm's financial cost concern has a significant direct and positive effect on the lack of provision of IT training for auditors. In particular, this variable contributes moderately to increasing the lack of provision of IT training by audit firms for their staff who deal with IT-based accounting systems (Beta = .320, $p < .01$). This finding indicates that the higher an audit firm's financial cost concern, the more likely it is that there will be a lack of provision of IT training by audit firms for their staff. Moreover, the audit firm's financial cost concern, the lack of education of auditors in IT and the lack of provision of IT training by audit firms for their staff, have significant direct and positive effects on the lack of competence of auditors in auditing IT-based accounting systems. Although all of these variables contribute moderately to increasing the lack of competence of auditors in auditing IT-based accounting systems, the audit firm's financial cost concern has a stronger impact on the lack of competence of auditors in auditing IT-based accounting systems than other variables (Beta = .283, $p < .05$ for the audit firm's financial cost concern; Beta = .219, $p < .05$ for the lack of education of auditors in IT; and Beta = .276, $p < .05$ for the lack of provision of IT training). These results imply that the higher an audit firm's financial cost concern, and/or auditors taking fewer courses in IT, or even taking no courses at all in the universities or colleges, and/or less provision of IT training by audit firms for their staff, the less competent or able auditors will be in dealing with IT-based accounting systems. Finally, only the use of the auditing around the computer approach and the lack of competence of auditors in auditing IT-based accounting systems have significantly direct and positive effects on the level of

detection risk (i.e. the target variable). Although both of these variables contribute moderately to increasing the level of detection risk, the use of the auditing around the computer approach has a stronger impact on the level of detection risk than the lack of competence of auditors in auditing IT-based accounting systems (Beta = .338, $p < .01$; as opposed to Beta = .297, $p < .05$). These findings suggest that the higher the use of the auditing around the computer approach by audit firms, and/or the higher the level of lack of competence of auditors in auditing IT-based accounting systems, the higher the level of detection risk. However, the audit firm's financial cost concern and the lack of education in IT of auditors contribute indirectly to increasing the level of detection risk through the mediation of the lack of competence of auditors in auditing IT-based accounting systems, the lack of IT training for auditors, and the use of the auditing around the computer approach; while the inappropriateness of the Saudi audit standard for an IT-based accounting environment contributes indirectly to increasing the level of detection risk through the mediation of the use of the auditing around the computer approach only. Examinations of the indirect effects of these independent variables on the dependent or the target variable (i.e. the level of detection risk) are shown in Table 9.26. As demonstrated from the figures in Table 9.26, the audit firm's financial cost concern is the strongest predictor of the level of detection risk in an IT-based accounting environment in SA, followed by the inappropriateness of the Saudi audit standard in an IT-based accounting environment, and the lack of education in IT of auditors (the total indirect effects of the variables mentioned above are .141, .087, and .084 respectively on the level of detection risk)[7]. Thus, it could be concluded that the roles of the use of the auditing around the computer approach, the lack of competence of auditors in

[7] It was mentioned above that these independent variables have only indirect effects on the dependent variable (i.e. level of detection risk). Thus, the indirect effect of each independent variable will be its total effect on the dependent variable.

auditing IT-based accounting systems, and the lack of IT training for auditors as intervening variables were confirmed by finding that independent variables influence the dependent variable (i.e. the level of detection risk) indirectly through their effects (i.e. independent variables) on the intervening variables.

Table 9.26 The Calculation of the Indirect Effects of the Independent Variables on the Dependent Variable in the Detection Risk Model	
Independent variables	**The dependent variable** ***Level of detection risk***
The inappropriateness of the audit standard	
• Indirect effect via the use of the auditing around the computer approach	.087
Total indirect effect	***.087***
The audit firm's financial cost concern	
• Indirect effect via the lack of competence of auditors	.084
• Indirect effect via the lack of competence of auditors, and the use of the auditing around the computer approach	.024
• Indirect effect via the lack of IT training and the lack of competence of auditors	.026
• Indirect effect via the lack of IT training, the lack of competence of auditors, and the use of the auditing around the computer approach	.007
Total indirect effect	***.141***
The lack of education in IT of auditors	
• Indirect effect via the lack of competence of auditors	.065
• Indirect effect via the lack of competence of auditors, and the use of the auditing around the computer approach	.019
Total indirect effect	***.084***

9.4 Conclusion

The purpose of this chapter, as was mentioned at the beginning, is to explore the relationships among the variables as articulated in the theoretical framework of this research discussed in Chapter Seven. The major findings that can be concluded from this chapter can be summarised in the following points (the model resulting from the study is presented in Figure 9.7).

Firstly, with respect to the inherent risk model in an IT-based accounting environment in SA, path analysis revealed the importance of the variables articulated in the model in determining or estimating the level of inherent risk. These results are in line with the theoretical framework in terms of the expected contribution of the variables included in the inherent risk model in increasing the level of this component of audit risk with the exception of the direct influence of clients' financial cost concern on the lack of competence of their staff in dealing with IT-based accounting systems. In particular, the findings of the path analysis show that the lack of understanding of IT of the client's management is the most influential variable on the level of inherent risk in an IT-based accounting environment. This is followed by the client's financial cost concern and the lack of education in IT of the client's staff respectively.

Secondly, regarding the control risk model in an IT-based accounting environment in SA, path analysis pointed out the importance of various variables articulated in the model in determining the level of control risk. These results are in agreement with the theoretical framework in terms of the expected contribution of the variables included in the control risk model in raising the level of this component of audit risk. In more detail, the findings of the path analysis show that the lack of understanding of IT of the client's

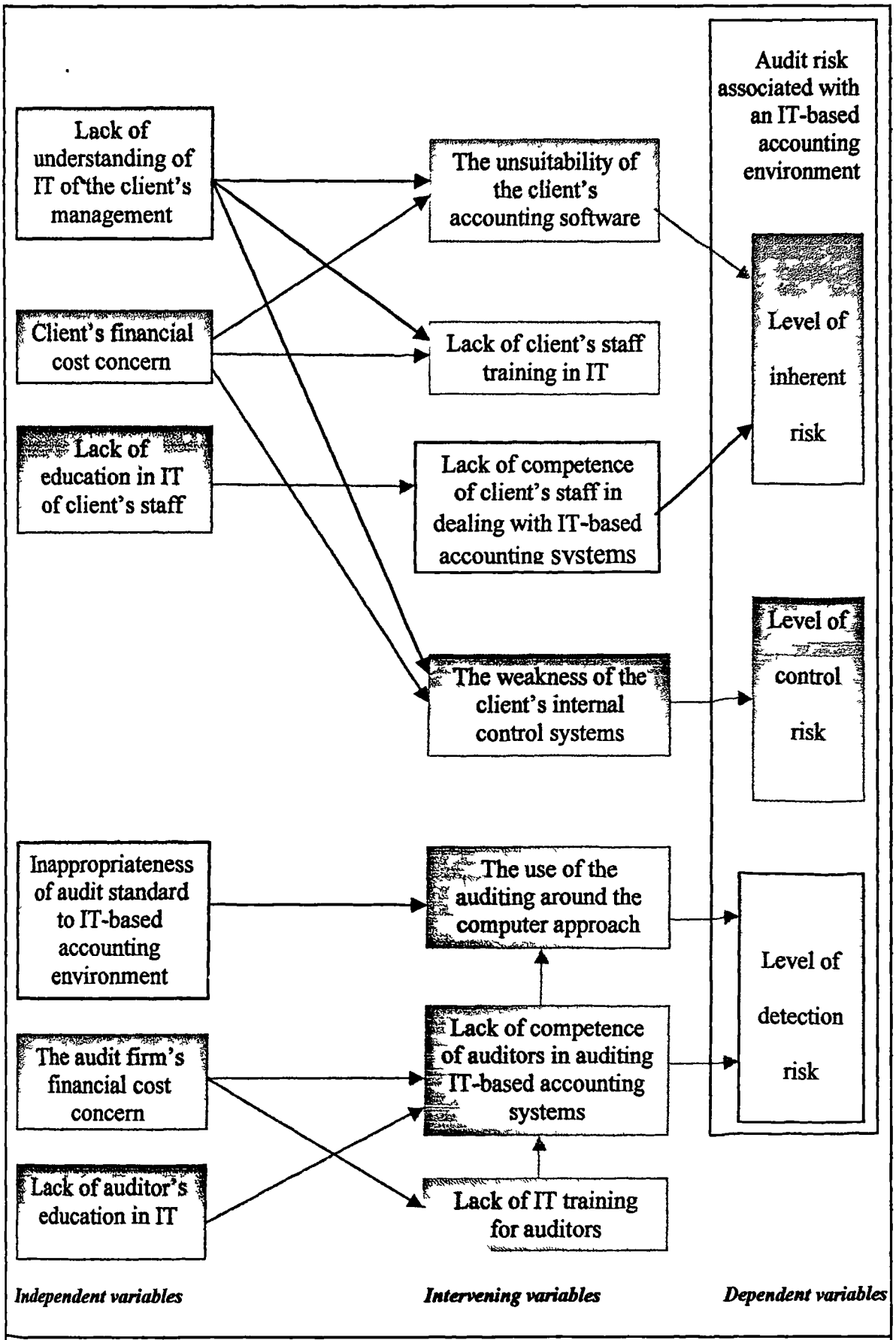

Figure 9.7 The Model Resulting from the Study

management is the most important variable which influences the level of control risk in an IT-based accounting environment. This is followed by the client's financial cost concern.

Finally, with respect to the detection risk model in an IT-based accounting environment in SA, path analysis has revealed the importance of the variables articulated in the model in the determination of the level of detection risk. These findings are in line with the theoretical framework in terms of the expected contribution of the variables included in the detection risk model in increasing the level of this component of audit risk. In particular, the findings of the path analysis show that the audit firm's financial cost concern is the most influential variable on the level of detection risk in an IT-based accounting environment in SA, followed by the inappropriateness of the Saudi audit standard in the IT-based accounting environment and the lack of education in IT of auditors respectively.

This section ends the discussion of the data analysis. This will lead to the final chapter which will cover the conclusions, implications and limitations of the study, and offer suggestions for further research.

CHAPTER TEN

CONCLUSIONS, IMPLICATIONS, LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

10.1 Introduction

The primary aim of this study was to investigate the impact of the adoption of IT-based accounting systems by the clients of audit firms in SA on the level of audit risk. The research used both qualitative and quantitative research methods in the collection of relevant data, in order to gain a better understanding of the phenomenon under investigation. This study has developed a model for explaining the variables that influence the level of audit risk in an IT-based accounting environment in SA.

The purpose of this chapter is to conclude the study by briefly summarising the major results obtained in the light of the objectives of the research and, in addition, to point out the practical implications of the study. The chapter also reviews the potential limitations of this research and suggests new areas for further investigation and exploration.

10.2 Summary of Major Findings

The summary of the major findings of this study is offered under the following headings:

10.2.1 The Increased Adoption of IT-based Accounting Systems

The results of the interviews (Chapter Six) and the questionnaires (Chapter Eight)

revealed increased adoption of IT-based accounting systems by the clients of audit firms in Saudi Arabia. In particular, there is a general tendency among these clients to adopt integrated IT-based accounting systems to eliminate the problems associated with stand-alone systems. It is interesting to find that all the audit firms that were surveyed in this study have clients with IT-based accounting systems and also that the majority of their clients had adopted integrated accounting systems. These findings support the researcher's conviction regarding the necessity of investigating the adoption of these systems by clients on the level of audit risk in the Saudi environment.

10.2.2 Identifying the Variables that are Related to Audit Risk in an IT-based Accounting Environment in SA

It was reported, in Chapter Five, that the literature discussed in Chapters Three and Four, focuses on the context of developed countries, mainly because of a lack of literature that concentrates on developing countries and which could help in providing a base for the present study. Thus, one of the major contributions of this study is that the findings of the interviews, confirmed by the results of the questionnaires, seem to clarify for the first time the variables that are likely to contribute to the level of audit risk in an IT-based accounting environment in SA. In addition, the findings of the questionnaires, which were presented in Chapter Eight, showed, in contrast to the researcher's expectations, that there were no significant differences among audit firms, based on their size, with respect to these variables.

The results of this study supported, to some extent, the potential risks discussed in Chapter Four based on Western literature, that are associated with auditing in an IT-based accounting environment. In particular, the findings that were reported in Chapter

Eight support the idea that the lack of competence of a client's personnel in IT, unreliable accounting software, inadequate internal controls, and a lack of skilled auditors in IT are potential risks in such an environment. However, it can be argued that the seriousness of these risks in the Saudi IT-based accounting environment is greater than in developed countries. This is can be explained by the fact that SA is a developing country and the application of IT in the Saudi environment is in its infancy. This, in turn, means that organisations' management are less likely to be sophisticated in IT issues compared with those in developed countries. In addition, the accounting and auditing profession in SA is also still in its infancy and, in turn, this may be contributing to a failure to comply with professional pronouncements by some accounting firms. Finally, accounting education in SA is still in its early stage so the gap between accounting education and current accounting practice (IT-based accounting systems) is likely to be greater than in developed countries.

Despite the similarities of the findings of this study with certain previous studies (written in the context of developed countries) regarding the potential risks associated with auditing in an IT-based accounting environment, it is worth mentioning that this study is different in that it reveals that the application of an unsuitable audit approach (i.e. auditing around the computer) can be a potential source of audit risk in an IT-based accounting environment. More importantly, this study uncovers the factors that foster the potential risks associated with auditing in such an environment. In addition, the results of this study did not give support to the issue of "lack of a visible audit trail" that was mentioned in the Western literature. This was attributed by the participants of this study to the developments in accounting software and the absence of electronic commerce in the Saudi environment. Finally, the findings of this study did not accord

high importance to the abuse (e.g. fraud) of IT-based accounting systems as reported by the literature. A possible explanation for the low rate of abuse in an IT-based accounting environment in SA might be that the respondents' responses regarding abuse are based on discovered and not actual abuse; it might also be due to the fact that the application of IT in a Saudi IT-based accounting environment is less sophisticated compared with that in developed countries, or it might be attributed to the Islamic culture which has great impact on the lives of people there.

10.2.3 The Appropriateness of the Research Model

One of the objectives of this study was to assess the possible impact of the risks associated with auditing in an IT-based accounting environment on the level of audit risk. This assessment was conducted by testing the conceptual model, presented in Chapter Seven, which is designed specifically for this study. The results of the path analysis which were reported in Chapter Nine demonstrated that the theoretical model is appropriate for analysing the variables that influence the level of audit risk in an IT-based accounting environment in SA. These findings supported the expected relationships among variables as depicted in the theoretical framework of the research that was presented in Chapter Seven. The results revealed that the lack of understanding of IT of the client's management is the most influential variable on the level of inherent risk in an IT-based accounting environment, followed by the client's concern about financial cost, and the lack of education in IT of the client's staff respectively. In terms of control risk, the path analysis showed that the lack of understanding of IT of the client's management followed by the client's financial cost concern are the only two variables that influence the level of control risk in such an environment. Finally, the findings of the path analysis indicated that the audit firm's financial cost concern is the

most important variable which influences the level of detection risk, followed by the inappropriateness of the Saudi audit standard in the IT-based accounting environment, and the lack of education in IT of auditors respectively.

10.2.4 The Possibility of Audit Risk in an IT-based Accounting Environment in SA

It was mentioned, in Chapter One, that the question that needs to be answered is whether the level of audit risk has increased or decreased after the adoption of IT-based accounting systems by clients of audit firms in SA. In the light of the research findings that were reported in Chapters Six, Eight and Nine, it can be concluded that the adoption of IT-based accounting systems by clients in SA has contributed to a greater possibility of audit risk. This can be explained, on the one hand, by the existence of a number of risks in the clients' IT-based accounting environment, such as the unsuitability of clients' accounting software, the lack of competence of clients' staff in dealing with IT-based accounting systems, and the weaknesses of clients' internal control systems in such an environment. On the other hand, there exists a number of audit firms which are unqualified to audit in an IT-based accounting environment, especially in terms of applying an inappropriate audit approach for examining the reliability of IT-based accounting systems together with a lack of competence of auditors in auditing such systems. These firms are not following the requirements of, or may even not be acquainted with the Saudi audit standard in an IT-based accounting environment. Accordingly, this situation indicates that the possibility of audit risk in such an environment is quite high.

10.3 Practical Implications of the Study

The findings of this research have implications for various parties. In particular, the results that were presented in this study have implications for the organisations which use IT-based accounting systems, auditors who deal with such systems, audit firms which work in such an environment, the regulator of the profession in SA (SOCPA), and decision-makers in education. The following subsections explain how these findings could be utilised by these parties.

- **Organisations which Use IT-based Accounting Systems**

The organisations that use IT-based accounting systems should try to avoid or at least reduce the impact of these variables which are likely to have an influence on the level of inherent and control risk in order to protect their businesses. For example, management in these organisations should improve their knowledge of IT and also should not take crucial decisions, such as deciding on the type of accounting software used and the provision of IT training for their staff, based on the their financial cost; instead they should invest in such assets.

- **Auditors who Audit in an IT-based Accounting Environment**

Auditors should take into account these variables which are likely to have an influence on the level of inherent and control risk when they plan to audit in an IT-based accounting environment. In particular, they should pay more attention to the lack of understanding of IT of the client's management and the client's financial cost concern since these variables would foster the unsuitability of their clients' accounting software, the lack of their clients' staff training in IT, the lack of competence of their clients' staff in dealing with IT-based accounting systems, and the weaknesses in their clients'

internal control systems. These would, in turn, increase the level of inherent and control risk in such an environment.

- **Audit Firms which have Clients with IT-based Accounting Systems**

With reference to audit firms, they should invest in their staff who audit IT-based accounting systems by, for example, conducting training sessions for them, rather than being constrained by the financial cost associated with such an investment. Otherwise, the ability of their staff in such an environment will be poor and this will, in turn, raise the possibility of failure in detecting critical misstatements which may then be very costly. In addition, they should adhere to the requirements of the Saudi audit standard in an IT-based accounting environment, especially in terms of the audit approach, by applying CAATs in order to enhance the trust of the users of the financial statements and also to protect themselves from any lawsuit which might be taken out against them due to their negligence.

- **The Regulator of the Profession in SA**

Regarding the regulator of the profession in SA (SOCPA), its members should think again about the practicality of the "*Audit Standard in Organisations that Use the Computer*" that was issued in 1997, either by revising it to be more appropriate to the Saudi IT-based accounting environment and, in turn, be more understandable to auditors, or through conducting training sessions for auditors to explain how such a standard can be applied in practice in terms of the Saudi context. In addition, SOCPA should ensure the competence of the auditors who audit IT-based accounting systems by including some courses covering auditing in an IT-based accounting environment, such as a requirement for passing professional exams. Also, they should check the quality of

the work of audit firms which audit IT-based accounting systems. Furthermore, they should be proactive in following up audit firms which do not comply with audit standards.

- **Decision-makers in Education**

Finally, the findings of this study may be useful for decision-makers in education who should improve their programmes in higher education institutions (i.e. universities and colleges) to include more courses in IT to qualify their students to deal competently with IT-based accounting systems. To be more precise, they should teach their students the features of this environment in terms of theory and also how to apply such features in practice in order to graduate students who have the ability to deal with such systems. Otherwise, they might be a source of risk for their employers in IT-based accounting environments.

10.4 Limitations of the Study

Almost all studies are constrained in some way or another. Thus, the findings of a study should be assessed and interpreted in the light of the limitations that may apply to this study. This research has the following limitations.

Firstly, it is important to note that this study focuses only on those variables that are likely to have an influence on the level of audit risk and, at the same time, relate to IT. In other words, this study does not take into account any variables that might have an influence on the level of audit risk in such an environment but which are not associated with IT.

A further limitation is that this study is conducted in Saudi Arabia which is classified as developing county. In other words, it is a country-specific study. As a result, the findings of this study might not be applicable to developed countries or even to other developing countries since each country has its own unique features even though countries may possess many common features.

10.5 Suggestions for Further Research

As a result of this study, a number of related issues have emerged for further investigation. These issues are outlined below.

Firstly, one of the major contributions of this study is the theoretical model which was developed in this study to articulate the variables that are likely to contribute to the level of audit risk in an IT-based accounting environment. Accordingly, one important extension of this research is to investigate the generalisability of this theoretical model in other developing countries. This is important because such a utilisation of the model might result in enhancing its structure.

Secondly, the theoretical model developed for this study does not include any variables that are not related to IT, but which still could have an impact on the level of audit risk in an IT-based accounting environment. Further research might examine all variables that might influence the level of audit risk in such an environment. This examination will verify whether including these variables would enrich the model, or perhaps a model focusing on the variables included is sufficient.

Finally, electronic commerce was not present in SA at the time of collecting the data for this study for the reasons that were highlighted earlier[1]. However, the situation has started to change for two reasons: firstly, the privatisation of Saudi Telecom which helped in facilitating access to the Internet by making it faster and cheaper; and secondly, the advent of globalisation which has pushed Saudi companies to utilise, among others things, electronic commerce to obtain new customers and also to provide better services for current customers[2]. Accordingly, an interesting area for further research would be an empirical investigation of the impact of IT on the level of audit risk taking into consideration the advent of electronic commerce in SA.

10.6 Concluding Remarks

Due to the increased adoption of IT-based accounting systems by different sizes of organisation, research which explores the risks associated with such systems will become increasingly important. However, there is a shortage of studies which attempt to investigate empirically the impact of the risks associated with such systems on audit risk especially in developing countries. As a result, this thesis is hopefully a significant step in this direction. In the Saudi context, IT is in its infancy. However, studying the risks associated with auditing in the Saudi IT-based accounting environment will become more important, especially considering the developments in IT and the advent of electronic commerce. Electronic commerce will probably expose clients' systems to greater risks and may make the task of auditors in such an environment even more difficult.

[1] For more details, please see Chapter Six.
[2] An example of the advent of electronic commerce in SA is that Saudi Airlines has allowed its customers to book and buy their tickets via the Internet since February 2003.

REFERENCES

Aba-Alkhail, K. (2001), ***Regulating the Auditing Profession in Saudi Arabia: the Formulation of Early Auditing Standards***, PhD Thesis, University of Essex.

Al-Faisal, A. (1992), "The Accounting Profession in Saudi Arabia", in Kwabena Anyane-Ntow (eds) ***International Handbook of Accounting Education and Certification***, Chapter 8, New York: Pergamon Press.

Al-Fehaid, A. and Higson, A. (2002), ***Studying the Impact of Information Technology on the Auditing Profession in Saudi Arabia: An Exploratory Study***, The Ninth Accounting Conference, Riyadh: King Saud University, 2-3 April.

Al-Motairy, O. (1999), ***Understanding the Emergence and Functioning of the Organising and Regulating of the Auditing Profession in Saudi Arabia: A Foucauldian Perspective***, PhD Thesis, University of Essex.

Al-Mushayt, O. (2000), ***An Empirical Investigation of Factors Influencing the Successful Treatment of Organisational Issues in Information Systems Development***, PhD Thesis, Loughborough University.

Al-Rehaily, A. S. (1992), ***The Evolution of Accounting in Saudi Arabia: A study of its Relevance to the Social and Economic Environment***, PhD Thesis, University of Hull.

Al-Rumaihi, J. (1997), ***Setting Accounting Standards in a Non-western Environment: with Special Reference to the Kingdom of Saudi Arabia***, PhD Thesis, Dundee University.

Al-Turki, Saleh M. and Tang, Nelson K. H. (1998), ***Information Technology Environment in Saudi Arabia: a Review***, working paper, University of Leicester, UK.

American Accounting Association (AAA) (1973), "A Statement of Basic Auditing Concepts", ***Studies in Auditing Research***, No. 6, Sarasota, p. 2.

Anderson, D., Sweeney, D. and Williams, T. (1999), ***Statistics for Business and Economics***, Ohio: South-Western College Publishing.

Arksey, H. and Knight, P. (1999), ***Interviewing for Social Scientists***, London: SAGE Publications.

Auditing Practices Board (1998), Statement of Auditing Standards 300: ***Accounting and Internal Control Systems and Audit Risk Assessments***, London: APB.

Auditing Practice Committee (1984), ***AG 407: Auditing in a Computer Environment***, London: ICAEW.

Bavishi, V. (1985), "Who Audit the World? International Accounting Firms' Operations in Developing Countries: The Case of Africa / Middle East", in Zimmerman, V. K. (ed). ***The Recent Accounting and Economic Developments in the Middle East***, Urbana-Champaign.

Bell, T. B., Knechel, W. R., and Payne, J. L. (1999), "Audit Risk Attributes In Computerized Environments", ***The Review of Accounting Information Systems***, Vol. 3, No. 2, pp. 27-39.

Bell, T. B., Knechel, W. R. Payne, J. L. and Willingham, J. J. (1998),"An Empirical Investigation of the Relationship Between the Computerization of Accounting Systems and the Incidences and Size of Audit Differences", ***Auditing: A Journal of Practice & Theory***, Vol. 17, No.1 Spring. PP 13-38.

Benston, G. J. (1975), "Accounting Standards in the United States and the United Kingdom: Their Nature, Causes and Consequences", ***Vanderbilt Law Review***, Vol. 28, pp. 235-268.

Bhaskar, K. N. and Williams, B. C. (1986), ***The Impact of Microprocessors on the Small Accounting Practice***, Exeter, Prentice-Hall.

Bierstaker, J., Burnaby, P. and Thibodeau, J. (2001), "The Impact of Information Technology on the Audit Process: an Assessment of the State of the Art and Implications for the Future", ***Managerial Auditing Journal***, Vol. 16, No. 3, pp. 159-164.

Billings, R. S. and Wroten, S. P. (1978), "Use of path analysis in industrial/organizational psychology: Criticisms and suggestions", ***Journal of Applied Psychology***, 63 (6), pp. 677 – 688.

Blewett, F. and Jarvis, R. (1989), ***Microcomputers in Accounting***, London: Van Nostrand Reinhold (International).

Bollen, K. A. *(1989)*, ***Structural Equations with Latent Variables***, New York: Wiley.

Boockholdt, J. (1983), "A Historical Perspective on the Auditor's Role: The Early Experience of the American Railroads", ***The Accounting Historians Journal***, Vol. 10, No. 1, Spring, pp. 69 – 86.

Bourque, L. and Fielder, E. (1995), ***How to Conduct Self-Administered and Mail Survey***, London: SAGE Publications.

Brown, R. (1962), "Changing Audit Objectives and Techniques", ***The Accounting Review***, October, pp. 696-703.

Bryman, A., and Cramer, D. (2001), ***Quantitative Data Analysis***, East Sussex: Routledge.

Bulmer, M. (1986), "The Role of Theory in Applied Social Science Research", in M. Bulmer et al. (ed.) ***Social Science and Society Policy***, London: George Allen & Unwin.

Canadian Institute of Chartered Accountants [CICA], (1999), ***Continuous Auditing***, Toronto: CICA.

Chambers, A. and Court, J. (1991), ***Computer Auditing***, London: Pitman Publishing.

Chartered Institute of Public Finance and Accountancy [CIPFA] (1987), ***Computer Audit Guidelines***, 3rd ed., London: CIPFA.

Christy, C. (1995), "Computer Fraud on the Rise", ***The Internal Auditor***, Vol. 52, 2, pp. 8-9.

Churchill, G. (1995), ***Marketing Research: Methodological Foundations***, (6th eds.) USA: Elizabeth Widdicombe.

Clegg, C. W., Ravden, S., Corbert, M. and Johnson, G. (1989), Allocating Functions in Computer Integrated Manufacturing: A Review and a New Method, ***Behaviour and Information Technology***. 8 (3): 175-190.

Coakes S. G. and Steed, L. G. (1999), ***SPSS Analysis Without Anguish***, Brisbane: John Wiley & Sons.

Comer, M. (1998), ***Corporate Fraud***, 3rd ed. England: Gower Publishing Limited.

Committee, B. (1979), "Factors Shaping the Independent Public Auditing Profession in the United States from 1905 to 1933", in Lee, T., ***The Evolution of Audit Thought and Practice***, New York & London: Garland Publishing.

Committee on Auditing Procedures, American Institute of Certified Public Accountants (1949), ***Internal Control***, New York: AICPA.

Computer Security Institute / Federal Bureau of Investigation (2002), ***Computer Crime and Security Survey***, San Francisco: Computer Security Institute.

Comrie, G. (2000), ***Software Development is Risky Business - - is Audit Ready?*** http://www.isaca.org/art13.htm

Cosserat, G. (2000), ***Modern Auditing***, West Sussex, England: John Wiley & Sons.

Creswell, J. (1994), ***Research Design: Qualitative & Quantitative Approaches***, USA: SAGE Publications.

Czaja, R. and Blair, J. (1996), ***Designing Surveys: A Guide to Decisions and Procedures***, Thousand Oaks: Pine Forge Press.

Davis, R. (1996), "Serving the Public Interest", ***True & Fair***, December 1995/January 1996, p.6.

Debreceny, R. and Gray, G. (1999), "Financial Reporting on the Internet and the External Audit", ***The European Accounting Review***, Vol. 8, No.2. pp 335-350.

Denscombe, M. (2002), ***Ground Rules for Good Research***, Buckingham: Open University Press.

Denzin, N. and Lincolen, Y. (1994), ***Handbook of Qualitative Research***, London: SAGE Publications.

Diamantopoulos, A. and Schlegelmilch B. (1997), ***Taking the Fear Out of Data Analysis***, London: The Dryden Press.

Dillon, W. R. and Goldstein, M. (1984), ***Multivariate Analysis: Methods and Applications***, New York: Wiley.

Dodd, F. (1992), ***Practical Computerised Accounting Systems***, Oxford: NCC Blackwell.

Doherty, N. F. and King, M. (1998), "The Importance of Organisational Issues in System Development", ***Information Technology and People***, 11 (2): pp. 104-123.

Douglas, I. (1995), ***Computer Audit and Control Handbook***, Oxford: Butterworth-Heinemann Ltd.

Drever, E. (1995), ***Using Semi-Structured Interviews in Small-Scale Research***, Edinburgh: SCRE Publication.

Dunn, J. (1996), ***Auditing: Theory and Practice***, (2nd ed). London: Prentice Hall.

Elkharouf, F. (1985), "Generally Accepted Accounting Principles in Saudi Arabia", in Zimmerman, V. K. (ed), ***The Recent Accounting and Economic Developments in the Middle East***, Urbana-Champaign.

Fardon, M. (2002), ***Computer Accounting***, Worcester: Osborne Books.

Fink, A. (1995), ***How to Design Surveys***. Thousand Oaks: SAGE Publications.

Flesher, D. (1993), "A History of Accounting and Auditing Before EDP", ***The EDP Auditor Journal***, Vol. 3, pp 38 – 47.

Fowler, F. (1984), ***Survey Research Methods***, Beverly Hills: SAGE Publications.

Fox, C., Robinson and Boardley, D. (1998), ***Cost Effectiveness of Follow-up Strategies in Improving Industrial Marketing Management***, 27: 127-133.

Frankfort-Nachmias C. and Nachmias, D. (1992), ***Research Methods in the Social Science***, (4th eds.) London: Edward Arnold.

Frey, J. and Oishi, S. (1995), ***How to Conduct Interviews by Telephone and in Person***, Thousand Oaks: SAGE Publications.

Furnell, S. and Warren, M. (1997), "Computer Abuse: Vandalizing the Information Society", ***Internet Research: Electronic Networking Applications and Policy***, Vol. 7, No. 1, pp. 61-66.

Furnell, S. and Warren, M. (1999), "Computer Hacking and Cyber Terrorism: The Real Threats in the New Millennium?", ***Computer & Security***, Vol. 18, pp. 28-34.

Galliers, R. (1992), ***Information System Research: Issues, Methods and Practical Guidelines***, Oxford: Blackwell.

Ghauri, P., Gronhaug, K. and Kristianslund, I. (1995), ***Research Methods in Business Studies: A Practical Guide***, London: Prentice Hall.

Gilbert, N. (1993), "Research, Theory and Method", in Gilbert, N. (ed.), ***Researching Social Life***, pp.18-31, London: SAGE Publications.

Gill, G., Cosserat, G., Leung, P. and Coram, P. (2001), ***Modern Auditing & Assurance Services***, (5th ed.) Sydney: John Wiley & Sons Australia, Ltd.

Gillham, B. (2000), ***The Research Interview***, London: Continuum.

Glaser, K. (1993), ***Auditing***, 2nd ed. London: Clays Ltd, St Ives plc.

Glaser, B. and Strauss, A. (1967), ***The Discovery of Grounded Theory: Strategies for Qualitative Research***, New York; Aldine.

Gorden, J. (1993), "Data Security- An Introduction" in Gorden, J., ***Practical Data Security***. Chapter 1, England: Ashgate.

Gray, I. and Manson, S. (2000), ***The Audit Process***, London: International Thomson Business Press.

Gwilliam, D. (1987), ***A Survey of Auditing Research*** (Chapter 19: Computer Auditing), London: Prentice / Hall International.

Hair, J., Anderson, R., Tatham, R. and Black, W. (1995), ***Multivariate Data Analysis*** (4th Edition), New Jersey, USA: Prentice-Hall.

Hall, J. A. (2001), ***Accounting Information Systems***, South-Western Publising Co.

Hannaford, C. (1995), "Can Computer Security Really Make a Difference?", ***Managerial Auditing Journal***, Vol. 10, No. 5, pp. 10-15.

Heckman, R. (1998), "Planning to Solve the Skills Problems in the Virtual Information Management Organization", ***International Journal of Information Management***, Vol. 18, No, 1, pp. 3-16.

Hein, L. (1963), "The Auditor and the British Companies Acts", ***The Accounting Review***, July, pp. 508-520.

Heise, D. R. (1969), "Problems in path analysis and causal inference", in E. F. Boratta (Ed.), ***Sociological Methodology***, pp. 38 – 73.

Helms, G. (1999), "Top Technology Concerns for the Attest, Audit and Assurance Services Functions", ***IS Audit & Control Journal***, Vol. II, pp. 46-48.

Helms, G. and Mancino, J. (1998), "The Electronic Auditor", ***Journal of Accountancy***, April, pp. 45-48.

Hermanson, R., Loeb, S. and Strawser, R. (1983), ***Auditing Theory and Practice***, Illinois: Richard D. Irwin.

Hickman, J. (1997), ***Practical IT Auditing***, New York: Warren, Gorham & Lamont.

Higson, A. (1987), ***An Empirical Investigation of the External Audit Process***, PhD Thesis, University of Bradford.

Higson, A. (1991), "The Rise of Analytical Auditing Procedures", in Sherer, M. and Turley, S., ***Current Issues in Auditing***. 2ne ed. Chapter 12. London: Paul Chapman Publishing.

Higson, A. (1997), "Developments in Audit Approaches: From Audit Efficiency to Audit Effectiveness?", in Sherer, M. and Turley, S., ***Current Issues in Auditing***. 3rd ed. Chapter 11. London: Paul Chapman Publishing.

Higson, A. (2002a), ***Continuous Reporting and Auditing: Conceptual Considerations,*** Fourth World Continuous Auditing and Reporting Symposium, Salford University, 18-19 April.

Higson, A. (2002b), ***The Importance and Difficulties of Researching into Fraud,*** Security Management Seminar, Loughborough University, 3rd December.

Higson, A. (2003), ***Corporate Financial Reporting,*** London: SAGE Publications.

Hinde, S. V. (1995), "Computer Fraud and Abuse", in Douglas, I., ***Computer Audit and Control Handbook,*** Oxford: Butterworth-Heinemann Ltd.

Hollander, A., Denna, E. and Cherrington, J. (1996), ***Accounting, Information Technology and Business Solutions,*** United States of America: IRWIN.

Hove, M. (1996), "Accounting Practices in Developing Countries: Colonialism's Legacy of Inappropriate Technology", in Blake, J. and Hossain, M., ***Readings in International Accounting.*** 1st ed. Chapter 10. London: International Thomson Business Press.

Hoyle, R. (1995), ***Structural Equation Modeling: Concepts, Issues and Applications,*** Thousand Oaks, CA: SAGE Publications.

Information System Audit and Control Association (ISACA), (1998), ***IS Auditing Guideline: Use of Computer Assisted Audit Techniques (CAATs),*** http://www.isaca.org/

Institute of Internal Auditors (1978), ***Standards for the Professional Practice of Internal Auditing,*** Altamonte Springs, Florida, p.1.

Institute of Internal Auditors (1992), ***System Auditability and Control,*** Institute of Internal Auditors, Altamonte Springs, Florida.

James, L. R. (1980), "The unmeasured variables problem in path analysis", ***Journal of Applied Psychology***, 65 (4), pp. 415 – 421.

Jones, R. (2000), "Sizing up NOP Software", ***Journal of Accountancy***, Vol. November, pp. 28-44.

Kerlinger, F. N. (1964), ***Foundations of Behavioural Research***, London: Holt, Rinehart and Winston.

Kerlinger, F. N. (1979), ***Behaviour Research: A Conceptual Approach***, New York: Holt, Rinehart & Winston.

Kervin, J. B. (1992), ***Methods for Business Research***, US: Harper Publishers Inc.

Kidder, L. and Judd, C. (1986), ***Research Methods in Social Relations***, New York: Holt Rinehart and Winston.

Kline, R. B. (1998), ***Principles and Practice of Structural Equation Modeling***, London: The Guildford Press.

Lainer, S. (1992), ***Computerized Accounting***, London: Prentice-Hall International Limited.

Lawrence, S. (1996), ***International Accounting***, London: International Thomson Business Press.

Lee, T. (1986), ***Company Auditing***, 3rd eds, England: Van Nostrand Reinhold Co. Ltd.

Lee, T. (1988), ***The Evolution of Audit Thought and Practice***, New York & London: Garland Publishing.

Lee, T. (1993), ***Corporate Audit Theory***, London: Chapman & Hall.

Lemon, M., Tatum, K. and Turely, S. (2000), ***Developments in Audit Methodologies of Large Accounting Firms***, Hertford: Stephen & Sons Ltd.

Li, C. C. (1975), ***Path Analysis - a Primer***, California: The Boxwood Press.

Litwin, M. (1995), ***How to Measure Survey Reliability and Validity***, Thousand Oaks: SAGE Publications.

Lyon, C., NG, G. and Woodliff, D. (1996), "UK Auditors' Perceptions of Inherent Risk", ***British Accounting Review***, Vol. 28, pp. 45-72.

MacCallum, R. (1986), "Specification Searches in Covariance Structure Modeling", ***Psychol. Bull.***, 100, pp. 107 – 120.

Manson, S. (1997), "Audit Risk and Sampling", in Sherer, M. and Turley, S., ***Current Issues in Auditing***. (3rd ed). Chapter 11, London: Paul Chapman Publishing.

Manson, S., McCartney, S. and Sherer, M. (1997), ***Audit Automation: The Use of Information Technology in the Planning, Controlling and Recording of Audit Work***, Bell and Bain Ltd, Glasgow.

Martin, P. Y. and Turner, B. A. (1986), "Grounded Theory and Organisational Research", ***Journal of Applied Behavioural Science***, 22 (2) NTL Institute.

Maruyama, G. M. (1998), ***Basics of Structural Equation Modeling***, Thousand Oaks, CA: SAGE Publications.

May, T. (1993), ***Social Research: Issues, Methods and Process***, Buckingham: Open University Press.

Merei, I. (1985), "Design and Application of Professional Standards in a Developing Country: The Case in Saudi Arabia", in Zimmerman, V. K. (ed). ***The Recent Accounting and Economic Developments in the Middle East***, Urbana-Champaign.

Mills, A. (1995), "Inadequate Security Encourages the Thief", ***Industrial Management & Data Systems***, Vol. 95, No. 2, pp. 3-5.

Monk, P. (1991), "The Impact of IT on the Economy", in Williams, B. and Spaul, B., ***I.T. and Accounting***, London: Chapman & Hall.

Moscove, S., Simkin, M. and Bagranoff, N. (1997), ***Core Concepts of Accounting Information Systems***, (5th ed.), New York: John Wiley & Sons, Inc.

Moustafa, M. E. (1985), "Framework for the Role of Accounting in the Economic Development in Saudi Arabia", in Zimmerman, V. K. (ed), ***The Recent Accounting and Economic Developments in the Middle East***, Urbana-Champaign.

Moyer, C. (1951), "Early Developments in American Auditing", **The** ***Accounting Review***, January, pp. 3-8.

Muggridge, J. and Trott, F. (1994), ***A Guide to Accounting Software***, (2nd ed.), UK: Clays Ltd, St Ives plc.

Nottingham, C. (1976), "Conceptual Framework for Improved Computer Audits", ***Accounting and Business Research***, Spring, pp. 140-148.

O'Brien, M. (1993), "Social Research and Sociology", in Gilbert, N. (ed.), ***Researching Social Life***, pp. 1-17, London: SAGE Publications.

Oxford Dictionary of Accounting (edited by Hussey, R.) (1995), Oxford: Oxford University Press.

Pathak, J. (2000), ***Potential of E-commerce and Ramifications for IT Auditing***, http://www.isaca.org/art18p.htm

Porter, B., Simon, J. and Hatherly, D. (1996), ***Principles of External Auditing***, Sussex: John Wiley & Sons Ltd.

Pound, G. D. (1978), "A Review of EDP Auditing", ***Accounting and Business Research***, Spring, No. 30, pp. 108-129.

Presley, J. and Westaway, A. (1989), ***A Guide to the Saudi Arabian Economy***, (2nd eds.) London: The Macmillan Press Ltd.

PricewaterhouseCoopers & DTI (2002), ***Information Security Breaches Survey 2002***, London: PricewaterhouseCoopers & DTI.
http://www.security-survey .gov.uk

Raval, V. (2000), ***Today's Information Systems Audits: Opportunities and Challenges***, http://www.isaca.org/art2a.htm

Remenyi, D., Williams, B., Money, A. and Swartz, E. (1998), ***Doing Research in Business and Management: An Introduction to Process and Method***, London: SAGE Publications.

Rezaee, Z., Elam, R. and Sharbatoghlie, A. (2001), "Continuous Auditing: the Audit of the Future", ***Managerial Auditing Journal***, Vol. 16, No. 3, pp. 150-158.

Rezaee, Z. and Reinstein, A. (1998), "The Impact of Information Technology on Auditing", ***Managerial Auditing Journal***, Vol. 13, No. 8, pp. 465-471.

Robson, C. (1996), ***Real World Research: A Resource for Social Scientists and Practitioner-Researchers***, Oxford: Blackwell Publishers Inc.

Ryan, B., Scapens, R. and Theobald, M. (1992), ***Research Method and Methodology in Finance and Accounting***, London: Academic Press.

Saudi Organisation for Public Accountants (SOCPA) (1997), ***Audit Standard in Organisations that Use the Computer***, Riyadh: Al-Homaidhi Press.

Saunders, M., Lewis, P. and Thornhill, A. (1997), ***Research Methods for Business Students***, London: Pitman Publishing.

Sekaran, U. (1992), ***Research Methods for Business: A Skill-Building Approach.*** New York: John Wiley & Sons, Inc.

Shah, A. and Higson, A. (1997), "Harnessing Technology: Real Time: Real Problem?", ***Accountancy***, October, p. 86.

Shinawi, A. and Crum, W. (1971), "The Emergence of Professional Accounting in Saudi Arabia", ***The International Journal of Accounting***, Vol. 6, No 2, pp. 103-110.

Silltow, J. (2003a), ***Considerations for Software Upgrades***, http://www.theiia.org/itaudit/index.cfm?fuseaction=print&fid=508

Silltow, J. (2003b), ***Software Change Control***, http://www.theiia.org/itaudit/index.cfm?fuseaction=print&fid=519

Silverman, D. (2000), ***Doing Qualitative Research: A Practical Handbook***, London: SAGE Publications.

Skudrna, V. (1982), "The Status of EDP Auditing", ***CPA Journal***, Vol. March, pp. 26-31.

Spaul, B. (1991), "Computer crime", in Williams, B. and Spaul, B., ***I.T. and Accounting***. Chapter 24, London: Chapman & Hall.

Taylor, D. and Glezen, G. (1994), ***Auditing: Integrated Concepts and Procedures***, 6th ed., New York: John Wiley & Sons.

Turely, S. and Cooper, M. (1991), ***Auditing in the United Kingdom***, London: Prentice Hall International.

Turley, S. (1989), "Concepts and Values in the Audit Methodologies of Large Accounting Firms", in ***The Future of the Audit***, England: ICAS/ICAEW.

Vasarhelyi, M. and Lin, T. (1988), ***Advanced Auditing***, Canada: Addison-Wesley Publishing Company.

Wasik, M. (1991), ***Crime and the Computer***, New York: Oxford University Press.

Watne, D. and Turney, P. (1984), ***Auditing EDP Systems***, (1st ed.), Englewood: Prentice-Hall.

Watne, D. and Turney, P. (1990), ***Auditing EDP Systems***, (2nd ed.), Englewood: Prentice-Hall.

Weiss, N. A. and Weiss, C. A. (1995), ***Introductory Statistics***, Massachusetts: Addison-Wesley.

Wildey, E. (1991), "Computers in Accounting and Education: How the Changing Role of Accountants could be Reflected in Courses", in Williams, B. and Spaul, B., ***I.T. and Accounting***, London: Chapman & Hall.

Williams, B. (1991), ***The Impact of Developments in Information Technology on Auditing and the Audit Process*** – Report to the Auditing Research Foundation of The Institute of Chartered Accountants in England and Wales.

Williams, B., Hood, K., Chen, J. and Russel, P. (1997), "Understanding Changes in Systems, Accounting and Auditing: the Impact of EDI", ***Managerial Auditing Review***, Vol. 12, No. 6, pp. 298-304.

Williamson, A. L. (1994), ***Audit Automation***, Accountants Digest No. 318, London: ICAEW.

Wood, R. (2002), ***No Accounting for Confusion***, http://www.smh.com.au/articles/2002/11/25/1038173686018.html

Woolf, E. (1997), ***Auditing Today***, Hertfordshire: Prentice Hall.

Younkins, E. (1988), "A History of Auditors' Independence in the U.S.", in Lee, T., ***The Evolution of Audit Thought and Practice,*** New York & London: Garland Publishing.

APPENDICES

APPENDIX 2.1

Developing countries

Afghanistan
Algeria
Angola
Antigua and Barbuda
Argentina
Bahamas
Bahrain
Bangladesh
Barbados
Belize
Benin
Bhutan
Bolivia
Botswana
Brazil
Brunei Darussalam
Burkina Faso
Burma
Burundi
Cameroon
Cape Verde
Central African Republic
Chad
Chile
Colombia
Comoros
Congo
Costa Rica
Cote d'Ivoire
Cuba
Cyprus
Democratic Kampuchea
Democratic People's Republic of Korea
Djibouti
Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
Equatorial Guinea
Ethiopia
Fiji
Gabon
Gambia
Ghana
Grenada
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
India
Indonesia
Iran (Islamic Republic of)
Iraq
Jamaica
Jordan
Kenya
Kiribati
Kuwait
Lao People's Democratic Republic
Lebanon
Lesotho
Liberia
Libyan Arab Jamahiriya
Madagascar
Malawi
Malaysia
Maldives
Mali
Malta
Mauritania
Mauritius
Mexico
Mongolia
Morocco
Mozambique
Nauru
Nepal
Nicaragua
Niger
Nigeria
Oman
Pakistan
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Qatar
Republic of Korea
Rwanda
Saint Christopher and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Samoa
San Marino
Sao Tome and Principe
Saudi Arabia
Senegal
Seychelles
Sierra Leone
Singapore
Solomon Islands
Somalia
Sri Lanka
Sudan
Suriname
Swaziland
Syrian Arab Republic
Thailand
Togo
Tonga
Trinidad and Tobago
Tunisia
Tuvalu
Uganda
United Arab Emirates
United Republic of Tanzania
Uruguay
Vanuatu
Venezuela
Yemen
Yugoslavia (or new countries formed from)
Zaire
Zambia
Zimbabwe

Source: United Nations Country Classification: Developing Countries as Reported by Lawrence (1996, p. 222)

Appendix 5.1 The English Version of the Interview Questions

Introduction

The study seeks to determine from practising accountants how they deal with IT-based accounting systems and how this affects the audit process. Responses will be treated in the strictest confidence and no comments will be attributed to individuals or firms.

Personal Information

1- Name of participant: .....

2- Job Title: .....

3- Organisation: ..... OR

4- Telephone: .....

5- Fax: .....

6- E-mail: .....

Attach Business Card

7- How long you have been with your firm?

.....

Section One: General Information

1- How do you classify your firm?

A. Large ☐

B. Medium ☐

C. Small ☐

2- What is the size of the audit clients that your firm is responsible for?

.....

3- What are the main business sectors of your audit clients?

.....

4- In relation to your response to the previous question, please give an estimate of the percentage of your clients who have IT-based accounting systems.

.....

5- What types of IT-based accounting systems do your clients have?

A. Simple (stand-alone accounting systems) ☐

B. Complex (fully integrated IT-based accounting systems or databases) ☐

C. Some simple and some complex ☐

6- What kind of developments do your clients make to their IT-based accounting systems?

A. New systems ☐

B. Up-grade old systems ☐

Section Two: Problems Associated with Clients' IT-based Accounting Environments

1- Can you describe any problems you or your colleagues have come across when auditing in an IT-based accounting environment?

.....

If the participant did not mention "Fraud", ask Question # 2. Otherwise, go to Question # 3.

2- Do IT-based accounting systems contribute to a greater risk of fraud?

.....

3- To what extent do you believe that accounting software is reliable?

.....

4- What, in your opinion, are the major problems involved in examining the internal controls in IT-based accounting systems?

.....

If the participant mentioned "the loss of the audit trail", go to Questions # 6 and # 7. If he did not, ask the following question:

5- To what extent, if at all, do you believe that the adoption of IT-based accounting systems causes "the loss of the audit trail"?

.....

If the participant's answer was "positive", ask the following questions. Otherwise, go to Question # 8.

6- Can you give some details about the nature of a problem such as "the loss of the audit trail"?

.....

7- How do you overcome a problem such as "the loss of the audit trail"?

.....

If the participant mentioned certain problems, ask the following question. Otherwise, go to the next section.

8- What, in your opinion, is the best way to reduce the impact of the problems that are associated with auditing in an IT-based accounting environment?

.....

Section Three: The Saudi Audit Standard Related to an IT-based Accounting Environment

1- What, in your opinion, are the advantages and disadvantages of the "Audit Standard in Organisations that Use the Computer" that was issued by SOCPA in 1997?

.....

2- Has your firm made any changes in its policy as a result of the issue of that Standard?

.....

If the participant's answer was "Yes", go to Question # 3. However, if it was "No", go to Question # 4.

3- Can you give some details about the nature of the change?

.....

4- What, in your opinion, are the reasons for your firm not changing its policy?

.....

5- Do you think that the IT-based accounting environment in Saudi Arabia needs more audit standards and guidelines?

.....

If the participant's answer was "Yes", ask the following question. Otherwise, go to Question # 7.

6- Why does the IT-based accounting environment in Saudi Arabia need more audit standards and guidelines?

.....

7- Do you believe that there is a relationship between the audit standard related to the IT-based accounting environment and audit risk?

.....

If the participant's answer was "positive", ask the following question:

8- How do you explain this relationship?

.....

Section Four: Audit Approach or Technique in an IT-based Accounting Environment

1- What is/are the key elements of your firm's audit approach?

A. Substantive approach ☐

B. System approach ☐

C. Risk-based approach ☐

D. High level risk approach ☐

2- Has the adoption of IT-based accounting systems by clients influenced your firm's audit approach?

.....

If the participant's answer to Question # 2 was "Yes", ask the following question. Otherwise go to Question # 4.

3- How has the adoption of IT-based accounting systems by clients influenced your firm's audit approach?

.....

4- Do you have an audit manual?

.....

If the participant's answer to Question # 4 was "Yes", ask the following question. Otherwise go to Question # 6.

5- Does it have an audit approach to IT-based accounting systems?

.....

6- Why you do not have an audit manual?

.....

7- How do you examine the reliability of internal controls in IT-based accounting systems?

.....

If the participant has not mentioned computer-assisted audit techniques (CAATs) approach, ask the following question. Otherwise, go to Question # 10.

Please explain CAATs to the participant as follows:

CAATs: Any automated audit techniques, such as Parallel Simulation, Test Data, Integrated Test Facility, and generalised audit software, that are used in performing various audit procedures to verify the reliability of internal controls (i.e. application controls) in an IT-based accounting system. These audit procedures include, for instance, tests of details of transactions and balances, compliance test of applications controls, and penetrations testing.

8- Have you heard of the term "CAATs"?

A. I have not heard about it. ☐

B. I have heard about it but I do not know what it means. ☐

C. I have heard about it and I know what it means but I do not use it. ☐

If the participant's answer was "C", go to Question # 9. Otherwise go to Question # 10.

9- For what reason/reasons do you not use CAATs when evaluating the reliability of internal controls in IT-based accounting systems?

.....

10- Do you think that a printout of accounting records is sufficient to give an opinion on the reliability of IT-based accounting systems?

.....

11- Do you think that there is any relation between the type of audit approach (comparing input with output or CAATs) used to examine the reliability of internal controls in IT-based accounting systems and audit risk?

.....

If the participant's answer was "Yes", ask the following question:

12- What sort of relationship do you think exists?

.....

Section Five: Auditor's Ability and Experience in an IT-based Accounting Environment

1- Do you believe that the adoption of IT-based accounting systems by clients in general has resulted in a change in the skills required of auditors?

.....

If the participant's answer was "Yes", ask the following question. Otherwise, go to Question # 3.

2- How did the adoption of IT-based accounting systems by clients in general result in a change in the skills required of auditors?

.....

3- What is the extent of the knowledge in IT required by your firm for auditors who audit financial statements prepared by IT-based accounting systems?

.....

4- Have you received any training to improve your knowledge in auditing IT-based accounting systems?

.....

If the participant's answer was "Yes", go to Questions # 5 and # 6. However, if it was "No", go to Question # 9.

5- Please describe what training you have received in respect of auditing IT-based accounting systems.

.....

6- What methods are used by your firm to qualify staff who audit IT-based accounting systems?

.....

If the participant mentioned certain method / methods, ask Questions # 7 and # 8. Otherwise, go to Question # 9.

7- Do you believe that the method / methods used by your firm sufficiently appreciate your audit requirements?

.....

8- Is it your perception that the method / methods used by your firm to qualify audit staff who deal with IT-based accounting systems is / are done in a logical and progressive manner?

.....

9- How do you deal with IT-based accounting systems?

.....

If the participant has not mentioned that his firm has an IT specialist, ask Question # 10. Otherwise, go to Question # 11.

10- Does your firm have specialists in examining IT-based accounting systems?

.....

If the participant's answer was "Yes", ask the following questions. Otherwise, go to Question # 13.

11- How many IT specialists does your firm have?

.....

12- When does your firm usually have recourse to IT specialists?

.....

13- Do you believe that an existing IT specialist within the audit team eliminates the need for an auditor to be qualified in IT?

.....

If the participant's answer was "positive", ask the following question. Otherwise, go to Question # 15.

14- How can an auditor judge that the examination carried out by an IT specialist is sufficient?

.....

15- To what extent do you think that external auditors can depend on the client's staff when they audit IT-based accounting systems?

.....

If the participant's answer was "positive", ask the following question. Otherwise, go to Question # 17.

16- Do you think this dependence may threaten the auditor's independence?

.....

17- To what extent, if at all, do you believe that the adoption of IT-based accounting systems by clients has affected the auditor's ability to audit such systems?

.....

18- What, in your opinion, are the reasons for the lack of competence of auditors in auditing IT-based accounting systems?

.....

19- Do you think that there is any relation between the auditor's ability to deal with IT-based accounting systems and audit risk?

.....

If the participant's answer was "positive", ask the following question:

20- How do you explain this relationship?

.....

Section Six: Financial Issues Related to Auditing in an IT-based Accounting Environment in SA

1- In what way, if at all, have financial constraints affected your firm's audit approach in respect of IT-based accounting systems?

.....

2- To what extent do you believe it is necessary for your firm to expend resources on the following:

A- Training the audit staff who deal with IT-based accounting systems

.....

B- Purchasing (or designing) generalised audit software (GAS)

Please explain GAS to the participant as follows:

GAS: a computer program or series of programs designed to perform certain automated functions for audit purposes. These functions include reading computer files, selecting data, manipulating data, sorting data, summarising data, performing calculations, selecting samples, and printing reports or letters in a format specified by the auditor.

.....

3- To what extent do you believe it is advantageous for the purposes of competition to have audit teams who are qualified to audit IT-based accounting systems?

.....

Section Seven: The Future of the Audit Profession in an IT-based Accounting Environment in SA

1- Over the next five to ten years, how do you see the nature of auditing changing as a result of the increasing adoption of IT-based accounting systems by clients?

.....

2- Is electronic commerce now current in Saudi Arabia?

.....

If the participant's answer was "Yes", ask the following question.

3- Do you think that the use of electronic commerce affects the audit function in Saudi Arabia?

.....

4- Do you have any other comments?

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Thank you very much for your participation in this research

Appendix 5.2 The Arabic Version of the Interview Questions

أسئلة المقابلة الشخصية

مقدمة

هذه الدراسة تبحث في كيفية تعامل المراجعين مع الأنظمة المحاسبية الحاسوبية وكيف يؤثر ذلك على مراحل عملية المراجعة. و أؤكد لكم أن أجابتكم سوف تعامل في غاية السرية وللأغراض العلمية فقط ولن يتم الإشارة في هذا البحث إلى أشخاص أو مكاتب معينة.

معلومات شخصية

ألصق كرت العمل

أو

١- اسم المشارك: .....

٢- مسمى الوظيفة: .....

٣- المنشأة: .....

٤- الهاتف: .....

٥- الفاكس: .....

٦- البريد الإلكتروني: .....

٧- كم مدة العمل مع شركتك؟

.....

الجزء الأول: معلومات عامة

١- كيف تصنف شركتك؟

أ- كبيرة ☐

ب- متوسطة ☐

ج- صغيرة ☐

٢- ما حجم عملاء شركتك ؟

.....

٣- ما هو القطاع التجاري الرئيسي لعملائك؟

.....

٤- فيما يتعلق بالسؤل السابق، فضلا حدد بصورة تقريبية نسبة عملائك الذين لديهم أنظمة محاسبية حاسوبية؟

.....

٥- ما أنواع الأنظمة المحاسبية الحاسوبية التي لدى عملائك؟

أ- بسيطة (أنظمة محاسبية مستقلة) ☐

ب- معقدة (أنظمة محاسبية مترابطة بشكل كامل أو قواعد بيانات) ☐

ج- البعض بسيطة و البعض معقدة ☐

٦- ما نوع التطوير الذي يقوم به عملائك لأنظمتهم المحاسبية الحاسوبية؟

أ- أنظمة جديدة ☐

ب- تطوير الأنظمة القديمة ☐

الجزء الثاني: مشاكل مرتبطة ببيئة العملاء المحاسبية الحاسوبية

١- هل من الممكن أن تصف أي مشاكل واجهتك أو واجهة زملائك عند المراجعة في البيئة المحاسبية الحاسوبية؟

.....

إذا المشارك لم يذكر" الاحتيال" اطرح السؤال #٢ . خلاف ذلك، اذهب للسؤال #٣ .

٢- هل الأنظمة المحاسبية الحاسوبية ساهمت في زيادة خطر الاحتيال؟

.....

٣- إلى أي حد تعتقد أن البرامج المحاسبية الحاسوبية موثوقة؟

.....

٤- ما هي من وجهة نظرك أهم المشاكل المرتبطة بفحص أنظمة الرقابة الداخلية في الأنظمة المحاسبية الحاسوبية؟

.....

إذا المشارك ذكر" فقدان علامة المراجعة"، اذهب للسؤالين #٦ و #٧ . لكن إذا لم يذكرها، اطرح السؤال التالي:

٥- إلى أي حد، إذا لم يكن إطلاقا، تعتقد بان استخدام الأنظمة المحاسبية الحاسوبية سبب "فقدان علامة المراجعة".

.....

إذا كانت إجابة المشارك "إيجابية"، اطرح الأسئلة التالية. خلاف ذلك، اذهب للسؤال #٨.

٦- هل من الممكن أن تزودنا ببعض التفاصيل عن طبيعة هذه المشكلة "فقدان علامة المراجعة"؟

.....

٧- كيف تتغلب على هذه المشكلة "فقدان علامة المراجعة"؟

.....

إذا المشارك ذكر مشاكل محددة اطرح السؤال التالي. خلاف ذلك، اذهب للجزء التالي.

٨- ما هي، من وجهة نظرك، أفضل طريقة لتقليل أثر الأخطار المصاحبة للمراجعة في البيئة المحاسبية الحاسوبية؟

.....

الجزء الثالث: معيار المراجعة السعودي المتعلق بالبيئة المحاسبية الحاسوبية

١- ما هي، من وجهة نظرك، مزايا و عيوب "معيار المراجعة في المنشآت التي تستخدم الحاسب الآلي" الذي أصدرته الهيئة السعودية للمحاسبين القانونين في عام ١٩٩٧م؟

.....

٢- هل شركتك عملت أي تغيرات في سياستها نتيجة لإصدار هذا المعيار؟

.....

إذا كانت إجابة المشارك "نعم"، اذهب للسؤال #٣. لكن إذا كانت "لا"، اذهب للسؤال #٤.

٣- هل من الممكن أن تعطينا بعض التفاصيل عن طبيعة هذا التغيير؟

.....

٤- ما هي، من وجهة نظرك، الأسباب التي منعت شركتك من تغيير سياستها؟

.....

٥- هل تعتقد أن البيئة المحاسبية الحاسوبية في السعودية تحتاج إلى إصدار مزيد من معايير المراجعة و الإرشادات ؟

.....

إذا كانت إجابة المشارك "نعم"، اطرح السؤال التالي. خلاف ذلك، اذهب للسؤال #٧.

٦- لماذا البيئة المحاسبية الحاسوبية في السعودية تحتاج إلى إصدار مزيد من معايير المراجعة و الإرشادات ؟

.....

٧- هل تعتقد أن هناك علاقة بين معايير المراجعة المتصلة بالبيئة المحاسبية الحاسوبية و خطر المراجعة؟

.....

إذا كانت إجابة المشارك "إيجابية"، اطرح السؤال التالي:

٨- كيف تشرح هذه العلاقة؟

.....

الجزء الرابع: طريقة المراجعة في البيئة المحاسبية الحاسوبية

١- ما هو المبدأ / العامل الأساسي في طريقة المراجعة التي تنتهجها شركتك؟

أ- طريقة الاختبارات الأساسية ☐

ب- طريقة فحص نظام الرقابة الداخلية ☐

ج- طريقة تقييم الخطر ☐

د- طريقة تقييم الخطر الأعلى ☐

٢- هل استخدام الأنظمة المحاسبية الحاسوبية بواسطة العملاء أثر على طريقة المراجعة التي تنتهجها شركتك؟

.....

إذا كانت إجابة المشارك على هذا السؤال "نعم"، اطرح السؤال التالي. خلاف ذلك، اذهب للسؤال #٤.

٣- كيف استخدام الأنظمة المحاسبية الحاسوبية بواسطة العملاء أثر على طريقة المراجعة التي تنتهجها شركتك؟

.....

٤- هل لديكم دليل مراجعة؟

.....

إذا كانت إجابة المشارك على هذا السؤال "نعم"، اطرح السؤال التالي. خلاف ذلك، اذهب للسؤال #٦.

٥- هل دليل المراجعة يشتمل على طريقة مراجعة للأنظمة المحاسبية الحاسوبية؟

.....

٦- لماذا ليس لديكم دليل مراجعة؟

.....

٧- كيف تفحص مدى مصداقية / موثوقية الرقابة الداخلية في الأنظمة المحاسبية الحاسوبية؟

.....

إذا المشارك لم يذكر أساليب المراجعة بمساعدة الحاسب الآلي (CAATs) ،اطرح السؤال التالي. خلاف ذلك، اذهب للسؤال #١٠ .

أشرح أساليب المراجعة بمساعدة الحاسب الآلي (CAATs) للمشارك كالتالي:

أي أساليب مراجعة آلية، مثل المحاكاة المتوازية، اختبار البيانات، طريقة الاختبار المتكامل، وبرامج المراجعة العامة، تستخدم في عمل إجراءات المراجعة المختلفة لفحص موثوقية الرقابة الداخلية(الرقابة التطبيقية) في الأنظمة المحاسبية الحاسوبية . هذه الإجراءات تشمل، على سبيل المثال، اختبارات لتفاصيل التحويلات والأرصدة، اختبار التماثل للرقابات التطبيقية، و اختبار الاختراقات .

٨- هل سمعت عن مصطلح أساليب المراجعة بمساعدة الحاسب الآلي(CAATs)؟

أ- لم أسمع به ☐

ب- سمعت به ولكن ما أعرف ما هو ☐

ج- سمعت به وأعرف ما هو ولكن لا أستخدمه ☐

إذا كانت إجابة المشارك "ج"، اذهب للسؤال #٩ . خلاف ذلك، اذهب للسؤال #١٠ .

٩- ما هي الأسباب التي تحول دون استخدام أساليب المراجعة بمساعدة الحاسب الآلي (CAATs) عند فحص مدى مصداقية / موثوقية الرقابة الداخلية في الأنظمة المحاسبية الحاسوبية؟

.....

١٠- هل تعتقد أن طباعة نسخ (printouts) من السجلات المحاسبية الحاسوبية تعتبر كافية للحكم على مدى مصداقية الأنظمة المحاسبية الحاسوبية؟

.....

١١- هل تعتقد أن هناك أي علاقة بين طريقة المراجعة [مقارنة المدخلات مع المخرجات أو أساليب المراجعة بمساعدة الحاسب الآلي(CAATs)] المستخدمة في فحص مدى مصداقية / موثوقية الرقابة الداخلية في الأنظمة المحاسبية الحاسوبية و خطر المراجعة؟

.....

إذا كانت إجابة المشارك "نعم" ، اطرح السؤال التالي:

١٢- أي نوع من العلاقة تعتقد وجوده؟

.....

الجزء الخامس: مهارة وخبرة المراجع في البيئة المحاسبية الحاسوبية

١- هل تعتقد أن استخدام العملاء للأنظمة المحاسبية الحاسوبية بصفة عامة نتج عنة تغير في المهارات المطلوبة من المراجع؟

.....

إذا كانت إجابة المشارك "نعم" ،اطرح السؤال التالي. خلاف ذلك، اذهب للسؤال #٣ .

٢- كيف أن استخدام العملاء للأنظمة المحاسبية الحاسوبية بصفة عامة نتج عنة تغير في المهارات المطلوبة من المراجع؟

.....

٣- ما مدى المعرفة في تقنية المعلومات الذي تطلب شركتك توفره في المراجعين الذين يراجعون بيانات مالية معدة بواسطة أنظمة محاسبية حاسوبية؟

.....

٤- هل تلقيت أي تدريب في تقنية المعلومات من أجل تطوير مستوى معرفتك في مراجعة الأنظمة المحاسبية الحاسوبية؟

.....

إذا كانت إجابة المشارك "نعم" ، اذهب للأسئلة#٥ و#٦ . لكن إذا كانت "لا" ، اذهب للسؤال #٩ .

٥- فضلا صف نوعية التدريب الذي تلقيته وله علاقة بمراجعة الأنظمة المحاسبية الحاسوبية؟

.....

٦- ما هي الطرق المستخدمة من قبل شركتك لتأهيل الطاقم الذي يراجع الأنظمة المحاسبية الحاسوبية؟

.....

إذا المشارك ذكر طريقة / طرق محددة، اطرح أسئلة #٧ و #٨. خلاف ذلك، اذهب للسؤال # ٩.

٧- هل تعتقد أن الطرق المستخدمة من قبل شركتك لتأهيل الطاقم الذي يراجع الأنظمة المحاسبية الحاسوبية، تلبي بشكل كاف احتياجاتك المتصلة بمراجعة هذه الأنظمة؟

.....

٨- هل تحس أن الطرق المستخدمة من قبل شركتك لتأهيل الطاقم الذي يراجع الأنظمة المحاسبية الحاسوبية نفذت بطريقة منطقية و متدرجة؟

.....

٩- كيف تتعامل مع الأنظمة المحاسبية الحاسوبية؟

.....

إذا المشارك لم يذكر أن شركته لديها متخصص في تقنية المعلومات، اطرح السؤال #١٠. خلاف ذلك، اذهب للسؤال #١١.

١٠- هل لدى شركتك متخصصين في فحص الأنظمة المحاسبية الحاسوبية؟

.....

إذا كانت إجابة المشارك "نعم"، اطرح السؤال التالي. خلاف ذلك، اذهب للسؤال #١٣.

١١- كم عدد المتخصصين في تقنية المعلومات الموجدين في شركتك؟

.....

١٢- متى يتم الاستعانة بالمتخصصين في تقنية المعلومات؟

.....

١٣- هل تعتقد بأن وجود متخصص في تقنية المعلومات ضمن فريق المراجعة يلغي حاجة أن يكون المراجع مؤهل في تقنية المعلومات؟

.....

إذا كانت إجابة المشارك "إيجابية"، اطرح السؤال التالي. خلاف ذلك، اذهب للسؤال #١٥.

١٤- كيف يستطيع المراجع الحكم على أن الفحص الذي نفذه المتخصص في تقنية المعلومات كافي؟

.....

١٥- إلى أي حد تعتقد أن المراجعين الخارجيين يمكن أن يعتمدوا على موظفي العميل عند مراجعتهم للأنظمة المحاسبية الحاسوبية؟

.....

إذا كانت إجابة المشارك "إيجابية"، اطرح السؤال التالي. خلاف ذلك، اذهب للسؤال #١٧ .

١٦- هل تعتقد بأن هذا الاعتماد ربما يهدد استقلال المراجع؟

.....

١٧- إلى أي حد، إذا لم يكن إطلاقا، تعتقد بأن استخدام العملاء للأنظمة المحاسبية الحاسوبية أثر على مقدرة المراجع على مراجعة مثل هذه الأنظمة؟

.....

١٨- ما هي، من وجهة نظرك، أسباب تدني كفاءة المراجعين في مراجعة الأنظمة المحاسبية الحاسوبية؟

.....

١٩- هل تعتقد أن هناك علاقة بين مقدرة المراجع على التعامل مع الأنظمة المحاسبية الحاسوبية و خطر المراجعة؟

.....

إذا كانت إجابة المشارك "إيجابية"، اطرح السؤال التالي:

٢٠- كيف تشرح هذه العلاقة؟

.....

الجزء السادس: القضايا المالية المتعلقة بالمراجعة في البيئة المحاسبية الحاسوبية في السعودية

١- بأي شكل، إذا لم يكن إطلاقا، أثرت القيود "أو الصعوبات" المالية على طريقة المراجعة التي تنتهجها شركتك في مراجعة الأنظمة المحاسبية الحاسوبية؟

.....

٢- إلى أي حد تعتقد بأنة من الضروري لشركتك أن تتوسع في الصرف على الأتي:

أ- تدريب طاقم المراجعة الذي يتعامل مع الأنظمة المحاسبية الحاسوبية؟

.....

ب- شراء (أو تصميم) برامج المراجعة العامة (GAS) ؟

اشرح برامج المراجعة العامة (GAS) للمشارك كما يلي:

أي برنامج حاسوبي أو سلسلة من البرامج مصممة لأداء وظائف آلية لأغراض المراجعة. هذه الوظائف تشمل قراءة ملفات الحاسب، اختيار البيانات، معالجة البيانات، تصنيف البيانات، تلخيص البيانات، عمل الحسابات، اختيار العينات، وطباعة تقارير أو خطابات في شكل محدد من قبل المراجع.

.....

٣- إلى أي حد تعتقد بأنة ميزة لأغراض المنافسة بأن يكون لديك فريق مراجعة مؤهل لمراجعة الأنظمة المحاسبية الحاسوبية؟

.....

الجزء السابع: مستقبل مهنة المراجعة في البيئة المحاسبية الحاسوبية السعودية

١- خلال خمس إلى عشر سنوات قادمة، كيف ترى طبيعة التغيرات في المراجعة نتيجة لزيادة استخدام الأنظمة المحاسبية الحاسوبية من قبل العملاء؟

.....

٢- هل التجارة الإلكترونية موجودة الآن في السعودية؟

.....

إذا كانت إجابة المشارك "نعم"، اطرح السؤال التالي:

٣- هل تعتقد بأن استخدام التجارة الإلكترونية أثر على مهنة المراجعة في السعودية؟

.....

٤- هل لديك أي تعليقات أخرى ترغب الإدلاء بها؟

.....

.....

.....

.....

.....

شكرا جزيلا على مشاركتك في هذا البحث.

Appendix 5.3 A Sample of the English Version of the Cover Letter for the Interview Participants

Dear Sir:

I am a postgraduate student from the Accountancy Department at Imam University. I am currently undertaking PhD research on "***The influence of information technology on audit risk***" under the supervision of Dr. Andrew W. Higson in the Business School at Loughborough University in the UK.

Carrying out this research has entailed completing some interviews with those working in the audit profession. The purpose of interviews is to elicit opinions about how auditors audit IT-based accounting systems. Your firm was chosen because of its good reputation in encouraging academic research and also its positive co-operation with researchers. I would be grateful if you could allow me to carry out an interview with the audit manager or any auditors in your firm.

The responses will be treated in the strictest confidence and no comments will be attributed to firms. Your participation in the research is vital to the successful completion of this study and is greatly appreciated.

Yours sincerely,

Abdullah Al-Fehaid

Appendix 5.4 A Sample of the Arabic Version of the Cover Letter for the Interview Participants

بسم الله الرحمن الرحيم

المكرم وبعد

السلام عليكم ورحمة الله وبركاته

أفيدكم بأنني أحد مبتعثي جامعة الإمام محمد بن سعود الإسلامية لدراسة الدكتوراه في تخصص المحاسبة في جامعة لفبرا (Loughborough University) في بريطانيا تحت إشراف الدكتور Andrew Higson، وموضوع رسالة الدكتوراه هو **"أثر تقنية المعلومات على خطر المراجعة"**

واقتضى أجرى هذا البحث عمل مقابلات شخصية مع العاملين في مهنة المراجعة تهدف إلى التعرف على كيفية مراجعة الأنظمة المحاسبية الحاسوبية. ووقع الاختيار على مكتبكم لما لكم من سمعة طيبة في تشجيعكم للبحث العلمي وأيضا حسن تعاونكم مع الباحثين. لذا أمل من شخصكم الكريم السماح لي بمقابلة مدير المراجعة أو أحد المراجعين العاملين في مكتبكم.

و أؤكد لكم أن أجابتكم سوف تعامل في غاية السرية وللأغراض العلمية فقط ولن يتم الإشارة في هذا البحث إلى أشخاص أو مكاتب معينة.

شاكرين لكم حسن تعاونكم والله يحفظكم ويرعاكم

أخوكم

عبدا لله بن محمد الفهيد

Business School
Loughborough University Leicestershire LE11 3TU UK
Switchboard: +44 (0)1509 263171

Loughborough University

To whom it may concern

Direct Line: +44 (0)1509 223104
Fax: +44 (0)1509 223960
E-mail: a.w.higson@lboro.ac.uk

5 December, 2000

Dear Sir

I would like to introduce Mr Abdullah Al-Fehaid to you. He is undertaking a PhD in the Business School at Loughborough University in the UK and I am his supervisor. He is studying the influence of audit clients' use of Information Technology on the external audit process. As you are aware this has been an important development in recent years and therefore I would be grateful of your assistance in his work.

Mr Abdullah Al-Fehaid (e-mail: af111@hotmail.com) would like to discuss the impact that Information Technology has had on the audit process with you or a member of your staff. The interview will seek to identify how auditors deal with IT-based accounting systems. I must stress that no comments will be attributed to individuals or firms.

Finally, I would like to thank you in advance for any assistance you are able to offer.

Yours faithfully

Dr Andrew Higson

Appendix 5.6 The English Version of the Questionnaire

Section One: General Information

IT-based accounting system: *refers to the collection, recording and processing of accounting data with the use of a computer.*

1- How many employees are in your audit firm? (*Please circle the suitable answer*)

Fewer than 6	***6 - 20***	***More than 20***
1	2	3

2- Please indicate approximately what proportion of your clients use IT-based accounting systems?

Proportion	%

3- What proportion of your clients use: a) An integrated accounting system (a system in which two or more accounting modules such as debtors, sales, purchases, creditors etc. are used together and share information); b) A stand-alone accounting system (a system in which only one module, such as sales, is used)?

The type of IT-based accounting systems	***Proportion***
A. Integrated accounting system	%
B. Stand-alone accounting system	%

Section Two: Clients' IT-based Accounting Environment

4- The following is a list of the possible problems faced by auditing firms while auditing in the client's IT-based accounting environment. Please indicate the extent to which your firm has experienced each of these problems. (*Please circle the suitable answer*)

Potential problems	*Never*	*Rarely*	*Sometimes*	*Often*	*Always*
A. The unsuitability of the client's accounting software (e.g. offering minimum level of information, poor or faulty programming, poor security, and frequent breakdowns).	1	2	3	4	5
B. The lack of competence of client's staff in dealing with IT-based accounting systems (e.g. they are unable to harness the advantages of IT systems, making mistakes).	1	2	3	4	5
C. Weaknesses of the client's internal control systems (e.g. no password, lack of segregation between authorities in changing data, lack of segregation between duties).	1	2	3	4	5
D. Fraud.	1	2	3	4	5
E. Others (Please Specify)					

5- Please indicate your agreement with the following reasons as the main reasons behind the existence of unsuitable accounting software in the client's IT-based accounting environment. (*Please circle the suitable answer*)

Reason	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
A. The concentration of the client on the cost rather than the quality.	1	2	3	4	5
B. Lack of understanding of IT of the client's management (i.e. choosing accounting software which does not fully suit their activities, and from providers who offer no after-sale services).	1	2	3	4	5
C. Others (Please indicate)					

6- Please specify approximately the proportion of your clients who use: a) ready-made accounting software; b) specific accounting software designed for their business.

The type of accounting software	*Proportion*
A. Ready-made	%
B. Specific software	%

7- Please indicate the extent to which you agree with the following reasons as the main reasons behind the lack of competence of client's staff in dealing with IT-based accounting systems. (*Please circle the suitable answer*)

Reason	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
A. Lack of IT training.	1	2	3	4	5
B. Unsuitable education (i.e. curricula in the universities and colleges do not contain any courses in IT and how to operate IT-based accounting systems).	1	2	3	4	5
C. Cost concerns, since training the existing staff would cost clients.	1	2	3	4	5
D. The high cost of employing skilled staff.	1	2	3	4	5
E. Others (Please specify)					

8- Please indicate the extent to which you agree with the following reasons for the weakness of client's internal control systems in an IT-based accounting environment. (*Please circle the suitable answer*)

Reason	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
A. The high cost associated with implementing tight internal controls (e.g. segregation of duties in an IT-based accounting environment requires more employees).	1	2	3	4	5
B. Lack of understanding of IT of the client's management (i.e. client's management is not aware of the nature of the IT-based accounting environment).	1	2	3	4	5
C. Others (Please specify)					

9- Do your clients' IT-based accounting systems crash? (*Please tick appropriate box*)

Yes		**No**	
Continue with Q. 10	☐	*Go directly to next section*	☐

10- What are the causes of your clients' accounting software crashing? (*Please circle the suitable answer*)

Potential causes	*Never*	*Rarely*	*Sometimes*	*Often*	*Always*
A. Fault in software	1	2	3	4	5
B. Lack of competence of client's staff in dealing with IT-based accounting systems	1	2	3	4	5
C. Power surge	1	2	3	4	5
D. Carelessness of client's staff	1	2	3	4	5
E. Fraud	1	2	3	4	5
F. Others (Please indicate)					

Section Three: The Audit Approach in the IT-based Accounting Environment

11- Are you acquainted with the "*Audit Standard in Organisations that Use the Computer*" that was issued by SOCPA in 1997? (*Please tick appropriate box*)

Yes		**No**	
Continue with Q. 12	☐	*Go directly to Q. 13*	☐

12- The following table presents a set of obstacles that might make "*Audit Standard in Organisations that Use the Computer*" that was issued by SOCPA in 1997 inappropriate to the IT-based accounting environment in SA.

Please indicate your opinion with regard to each obstacle. (*Please circle the suitable answer*)

Obstacle	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
A. The standard is not comprehensible to auditors.	1	2	3	4	5
B. The standard is unclear.	1	2	3	4	5
C. The standard is sophisticated compared with the level of application of IT in the accounting environment in SA (i.e. it is a translation of the American and International standards in this field and is too complex for the SA setting).	1	2	3	4	5
D. Others (Please specify)					

13- Please indicate the extent to which the following are used by your firm in examining the reliability of IT-based accounting systems. (*Please circle the suitable answer*)

The type of audit method	*Never*	*Rarely*	*Sometimes*	*Often*	*Always*
A. Comparing input with output	1	2	3	4	5
B. Computer-Assisted Audit Techniques (CAATs) (such as Parallel Simulation, Test Data, Integrated Test Facility [ITF], Generalised Audit Software)	1	2	3	4	5
C. Others (Please specify)					

14- Please indicate your agreement on whether the following reasons prevent your firm from using Computer-Assisted Audit Techniques. (*Please circle the suitable answer*)

Factor	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
A. The lack of skilled auditors who are able to implement such techniques.	1	2	3	4	5
B. The high cost of employing knowledgeable auditors in auditing IT-based accounting systems.	1	2	3	4	5
C. The high cost of recourse to IT specialists.	1	2	3	4	5
D. Inappropriateness of the audit standard issued by SOCPA in 1997 to the IT-based accounting environment in SA.	1	2	3	4	5
E. Others (Please indicate)					

15- Please indicate the type of knowledge in IT that is required by your audit firm for auditors who audit IT-based accounting systems. (*Please circle the suitable answer*)

The type of knowledge in IT	*Not required*	*Rarely required*	*Sometimes required*	*Often required*	*Highly required*
A. Basic knowledge in dealing with computers (e.g. printing a report).	1	2	3	4	5
B. Basic knowledge in auditing the common, ready-made accounting software.	1	2	3	4	5
C. Advanced knowledge in auditing IT-based accounting systems.	1	2	3	4	5
D. Others (Please indicate)					

16- Does your audit firm provide IT training to auditors who audit IT-based accounting systems? (*Please tick the appropriate box*)

Yes ☐ *Continue with Q. 17*

No ☐ *Go directly to Q. 18*

17- What is the level of training given to auditors who audit IT-based accounting systems in the following IT related areas: (*Please circle the suitable answer*)

IT related area	*None*	*Very basic level*	*Low level*	*Intermediate level*	*High level*	*Very high level*
A. Basic data processing concepts	1	2	3	4	5	6
B. On-line / real-time processing concepts	1	2	3	4	5	6
C. System and program documentation	1	2	3	4	5	6
D. Internal control in an IT-based accounting system	1	2	3	4	5	6
E. Auditing in an IT-based accounting environment	1	2	3	4	5	6

18- Please indicate your opinion on whether the following reason discourages your audit firm from conducting IT training sessions for auditors who audit IT-based accounting systems. (*Please circle the suitable answer*)

Nature of reason	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
A. The high cost of training.	1	2	3	4	5
B. Others (Please indicate)					

19- Please indicate the extent to which you agree with the following reasons for the lack of competence of auditors in auditing IT-based accounting systems. (*Please circle the suitable answer*)

Reason	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
A. Lack of IT training.	1	2	3	4	5
B. Unsuitable education (i.e. curricula in the universities and colleges do not contain any courses in IT and auditing in an IT-based accounting environment).	1	2	3	4	5
C. Others (Please indicate)					

Section Four: Audit Risk in an IT-based Accounting Environment

20- Please indicate to what extent, if at all, the following factors contribute to increases in the overall level of audit risk in an IT-based accounting environment. (*Please circle the suitable answer*)

Factor	*Level of contribution to audit risk*					
	No contribution	*Very low*	*Low*	*Medium*	*High*	*Very high*
A. ***Using unsuitable accounting software by client*** in terms of its unsuitability to the client's activity, poor or faulty programming, providing a minimum level of information, and making tracing of the transactions difficult.	1	2	3	4	5	6
B. ***Lack of competence of client's staff in dealing with IT-based accounting systems*** in terms of, for example, their inability to harness the advantages of IT systems, and in order to avoid mistakes.	1	2	3	4	5	6
C. ***The weakness of the client's internal control systems in an IT-based accounting environment*** in terms of, for example, no password and lack of segregation between authorities in changing data.	1	2	3	4	5	6
D. ***Using the auditing around the computer approach*** where auditors examine input and output *only* and where the detailed processing within the computer is *ignored.*	1	2	3	4	5	6
E. ***Lack of competence of auditors in auditing IT-based accounting systems*** in terms of, for example, their inability to use CAATs and their lack of awareness of the problems and risks associated with such systems.	1	2	3	4	5	6

21- Please rank what you consider to be the most important factors which contribute to increases in the overall level of audit risk in an IT-based accounting environment. (*Rank the most important factor **1**, the second most important factor **2**; and so on down to **5** for the least important*).

Factor	*Rank*
A. Use of unsuitable accounting software by client.	
B. Lack of competence of client's staff in dealing with IT-based accounting systems.	
C. The weakness of client's internal control systems in an IT-based accounting environment.	
D. Using the auditing around the computer approach.	
E. Lack of competence of auditors in auditing IT-based accounting systems.	

Section Five: Other Comments

Please make any further comments that you think are related to this topic.

.....

.....

.....

.....

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.....

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.....

If you would like a summary of the results of this questionnaire, please complete the details below:

Name: ..... Fax:.....

Firm:..... Telephone:.....

Address:..... E-mail:.....

.....

Thank you very much for taking the time to complete this questionnaire. Please check that you have answered all the questions and kindly return this via fax or the mail by using the enclosed envelope.

Appendix 5.7 The Arabic Version of the Questionnaire

الجزء الأول : معلومات عامة

النظام المحاسبي الحاسوبي: هو عبارة عن تجميع و تسجيل ومعالجة البيانات المحاسبية باستخدام الحاسب الآلي.

١ – كم عدد الموظفين في مكتبك المحاسبي ؟ (*فضلاً ضع دائرة حول رقم الإجابة المناسبة*)

أقل من ٦	من ٦ إلى ٢٠	أكثر من ٢٠
١	٢	٣

٢ – كم نسبة عملائك الذين يستخدمون أنظمة محاسبية حاسوبية ؟

النسبة	%

٣ – كم نسبة عملائك الذين يستخدمون: أ- نظام محاسبي حاسوبي متكامل (أي نظام يستحدم فيه حسابين أو أكثر من الحسابات المحاسبية مثل المدين، المبيعات ، المشتريات ، الدائنين ...الخ معاً ويتقاسما المعلومات)؛ ب- نظام محاسبي حاسوبي مستقل (أي نظام يستحدم فيه نموذج حساب محاسبي واحد فقط مثل المبيعات) ؟

نوع النظام المحاسبي الحاسوبي	النسبة
أ – نظام محاسبي حاسوبي متكامل (An integrated accounting system)	%
ب – نظام محاسبي حاسوبي مستقل (Stand-alone accounting system)	%

الجزء الثاني : بيئة العميل المحاسبية الحاسوبية

٤ – فيما يلي قائمة بالمشاكل المحتمل أن تواجهها مكاتب مراجعة الحسابات عندما يراجعون في بيئة العميل المحاسبية الحاسوبية. فضلاً حدد *مدى معاناة مكتبك* من كل مشكلة من تلك المشاكل. (*فضلاً ضع دائرة حول رقم الإجابة المناسبة*).

مشاكل محتملة	أبداً	نادراً	أحياناً	غالباً	دائماً
أ – ضعف في برامج المحاسبة المستخدمة من قبل العميل (مثل أن تعطي الحد الأدنى من مستوى المعلومات أو تكون برمجتها ضعيفة أو خاطئة أو يكون مستوى الأمان بها ضعيف أو يحدث لها تعطل مستمر)	١	٢	٣	٤	٥
ب – تدني كفاءة موظفي العميل في التعامل مع الأنظمة المحاسبية الحاسوبية خصوصاً في تقنية المعلومات (مثل أن يكونوا غير قادرين على استغلال مزايا نظم تقنية المعلومات أو يرتكبون أخطاء)	١	٢	٣	٤	٥
ج – ضعف في نظم الرقابة الداخلية في بيئة العميل (مثل عدم وجود كلمة سر، أو ضعف الفصل بين الصلاحيات في تغيير البيانات أو قلة الفصل بين الواجبات)	١	٢	٣	٤	٥
د – الاحتيال	١	٢	٣	٤	٥
هـ – مشاكل أخرى (فضلاً حددها)					

٥ – فضلاً حدد درجة موافقتك على الأسباب التالية باعتبارها الأسباب الرئيسية وراء وجود ***برامج محاسبية ضعيفة*** في بيئة العميل المحاسبية الحاسوبية. *(فضلاً ضع دائرة حول رقم الإجابة المناسبة).*

السبب	لا أوافق بشدة	لا أوافق	محايد	أوافق	اوافق بشدة
أ – تركيز العميل على التكلفة أكثر من الجودة	١	٢	٣	٤	٥
ب – قلة فهم (وعي) إدارة العميل لتقنية المعلومات (مثل اختيار برامج محاسبية لا تتناسب بشكل كامل مع نشاطاتهم ويشترونها من مزود خدمة لا يوفر خدمات ما بعد البيع).	١	٢	٣	٤	٥
ج – أسباب أخرى (فضلاً حددها)					

٦ – فضلاً حدد بصورة تقريبية نسبة عملائك الذين يستخدمون: أ – برامج محاسبية جاهزة ؛ ب– برامج محاسبية خاصة بنشاطهم التجاري

نوع برنامج المحاسبة	النسبة
أ – برامج محاسبية جاهزة (ready-made accounting software)	%
ب – برامج محاسبية خاصة (مصممة خصيصا لنشاط العميل)	%

٧ – فضلاً حدد درجة موافقتك على الأسباب التالية باعتبارها أسباب رئيسية في **تدني كفاءة موظفي العميل** في البيئة المحاسبية الحاسوبية. *(فضلاً ضع دائرة حول رقم الإجابة المناسبة)*

السبب	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
أ – قلة التدريب في تقنية المعلومات.	١	٢	٣	٤	٥
ب – التعليم غير المناسب (أي أن مناهج الجامعات والكليات لا تحتوي على أي مواد في تقنية المعلومات أو كيفية تشغيل الأنظمة المحاسبية الحاسوبية).	١	٢	٣	٤	٥
ج – مراعاة التكلفة لأن تدريب الطاقم الموجود سوف يكلف العميل	١	٢	٣	٤	٥
د – التكلفة العالية لتوظيف طاقم مؤهل في أنظمة تقنية المعومات	١	٢	٣	٤	٥
هـ – أسباب أخرى (فضلاً حددها)					

٨ – فضلاً حدد درجة موافقتك على الأسباب التالية باعتبارها أسباب ***ضعف نظم الرقابة الداخلية*** في بيئة العميل المحاسبية الحاسوبية. *(فضلاً ضع دائرة حول رقم الإجابة المناسبة)*

السبب	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
أ – التكلفة العالية المرتبطة بتنفيذ نظام رقابة داخلية محكم (مثلا الفصل بين الواجبات في البيئة المحاسبية الحاسوبية يتطلب زيادة عدد الموظفين).	١	٢	٣	٤	٥
ب – قلة فهم (وعي) إدارة العميل (مثل أن تكون إدارة العميل غير مدركة لطبيعة البيئة المحاسبية الحاسوبية).	١	٢	٣	٤	٥
ج – أسباب أخرى (فضلاً حددها)					

٩- هل الأنظمة لمحاسبية الحاسوبية لعملائك تتعطل؟

☐ نعم — استمر مع السؤال ١٠

☐ لا — اذهب مباشرة للجزء التالي

١٠ – ما هي *أسباب تعطل* برامج العميل المحاسبية الحاسوبية؟ *(فضلاً ضع دائرة حول رقم الإجابة المناسبة)*

مشاكل محتملة	أبداً	نادراً	أحياناً	غالباً	دائماً
أ – عيب في البرنامج	١	٢	٣	٤	٥
ب – تدني كفاءة موظفي العميل في التعامل مع الأنظمة المحاسبية الحاسوبية	١	٢	٣	٤	٥
ج – ارتفاع مفاجئ في التيار الكهربائي	١	٢	٣	٤	٥
د – إهمال موظفي العميل	١	٢	٣	٤	٥
هـ – الاحتيال	١	٢	٣	٤	٥
و- أسباب أخرى (فضلاً حددها)					

الجزء الثالث: طريقة المراجعة في البيئة المحاسبية الحاسوبية

١١ – هل أنت مطلع على "معيار المراجعة في المنشآت التي تستخدم الحاسب الآلي" الذي أصدرته الهيئة السعودية للمحاسبين القانونيين في عام ١٩٩٧م؟ (فضلاً ضع علامة في المربع المناسب)

☐ نعم — استمر مع السؤال ١٢

☐ لا — اذهب مباشرة للسؤال ١٣

١٣ – يعرض الجدول التالي عدة عوائق قد تجعل " معيار المراجعة في المنشآت التي تستخدم الحاسب الآلي" الذي أصدرته الهيئة السعودية للمحاسبين القانونين في عام ١٩٩٧م *غير ملائم* للبيئة المحاسبية الحاسوبية في السعودية.نرجو إبداء رأيك فيما يتعلق بكل عائق. *(فضلاً ضع دائرة حول رقم الإجابة المناسبة)*

السبب	لا أوافق بشدة	لا أوافق	محايد	أوافق	اوافق بشدة
أ – المعيار غير مفهوم من قبل المراجعين	١	٢	٣	٤	٥
ب – المعيار غير واضح	١	٢	٣	٤	٥
ج – المعيار متطور مقارنة مع مستوى تطبيق تقنية المعلومات في بيئة المحاسبة في السعودية (بمعنى أن المعيار ترجمة للمعايير الأمريكية والدولية في هذا المجال لذلك فهو لا يعكس واقع البيئة المحاسبية الحاسوبية في السعودية و با التالي يصعب تطبيقه حالياً)	١	٢	٣	٤	٥
د – عوائق أخرى (فضلاً حددها)					

١٣- فضلاً حدد إلى أي مدى استخدمت الطرق التالية من قبل مكتبك في فحص مصداقية النظم المحاسبية الحاسوبية. (فضلاً ضع دائرة حول رقم الإجابة المناسبة)

طريقة المراجعة	أبداً	نادراً	أحياناً	غالباً	دائماً
أ – مقارنة المدخلات مع المخرجات	١	٢	٣	٤	٥
ب – أساليب المراجعة بمساعدة الحاسب CAATs (مثل المحاكاة المتوازية أو اختبار البيانات أو طريقة الاختبار المتكامل ITF أو برامج المراجعة العامة).	١	٢	٣	٤	٥
ج– طرق أخرى (فضلاً حددها)					

١٤- الرجاء حدد درجة موافقتك على ما إذا كانت الأسباب التالية تمنع مكتبك المحاسبي من استخدام أساليب المراجعة بمساعدة الحاسب الآلي. (فضلاً ضع دائرة حول رقم الإجابة المناسبة).

السبب	لا أوافق بشدة	لا أوافق	محايد	أوافق	اوافق بشدة
أ – قلة المراجعين المهرة القادرين على تنفيذ هذه الأساليب.	١	٢	٣	٤	٥
ب – التكلفة العالية لتوظيف مراجعين ذوي دراية بمراجعة النظم المحاسبية الحاسوبية.	١	٢	٣	٤	٥
ج- التكلفة العالية للاستعانة بالمتخصصين في تقنية المعلومات	١	٢	٣	٤	٥
د- عدم ملائمة " معيار المراجعة في المنشآت التي تستخدم الحاسب الآلي" الذي أصدرته الهيئة في عام ١٩٩٧ للبيئة المحاسبية الحاسوبية السعودية.	١	٢	٣	٤	٥
هـ – عوامل أخرى (فضلاً حددها).					

١٥– من فضلك حدد مستوى المعرفة (الإطلاع) في تقنية المعلومات المطلوب من قبل مكتبك للمراجعين الذين يراجعون أنظمة محاسبية حاسوبية (فضلاً ضع دائرة على رقم الإجابة المناسبة) .

مستوى المعرفة في تقنية المعلومات	غير مطلوب	مطلوب قليلاً	أحياناً مطلوب	غالباً مطلوب	مطلوب بشكل عالي
أ – معرفة بسيطة في التعامل مع الحاسب "مثلاً طباعة تقرير "	١	٢	٣	٤	٥
ب – معرفة بسيطة في مراجعة برامج المحاسبة الشائعة والجاهزة.	١	٢	٣	٤	٥
جـ – معرفة متقدمة في مراجعة الأنظمة المحاسبية الحاسوبية .	١	٢	٣	٤	٥
د – مستويات أخرى (فضلاً حدد).					

١٦ – هل مكتبك يقدم تدريب في تقنية المعلومات للمراجعين الذين يراجعون أنظمة محاسبية حاسوبية ؟ (فضلاً ضع علامة في الخانة المناسبة).

نعم ☐ لا ☐

أستمر مع السؤال ١٧ ادهب مباشرة للسؤال ١٨

١٧ – ما مستوى التدريب المعطى للمراجعين الذين يراجعون أنظمة محاسبية حاسوبية في مجالات تقنيـــــات المعلومات التالية: (فضلاً ضع دائرة على رقم الإجابة المناسبة)

مجالات ذات صلة بتقنيات المعلومات	لا يوجد تدريب	مستوى بدائي	مستوى منخفض	مستوى متوسط	مستوى عالي	مستوى عالي جدا
أ– مفاهيم أساسية في معالجة البيانات	١	٢	٣	٤	٥	٦
ب – مفاهيم المعالجة الفورية (On-line / real-time).	١	٢	٣	٤	٥	٦
ج – توثيق البرامج و الأنظمة	١	٢	٣	٤	٥	٦
د – الرقابة الداخلية في الأنظمة المحاسبية الحاسوبية .	١	٢	٣	٤	٥	٦
هـ – المراجعة في البيئة المحاسبية الحاسوبية .	١	٢	٣	٤	٥	٦

١٨ – فضلاً حدد إلى أي درجة توافق على أن السبب التالي لا يشجع مكتبك المحاسبي على عقد دورات تدريبية في تقنيـــــة المعلومات للمراجعين الذين يراجعون أنظمة محاسبية حاسوبية . الرجاء إبداء رأيك فيما يتعلق بكل سبب . (فضلاً ضع دائرة على رقم الإجابة المناسبة).

طبيعة السبب	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
أ – التكلفة العالية للتدريب	١	٢	٣	٤	٥
ب – أسباب أخرى (فضلاً حدد).					

١٩ – مـــن فضـــلك حدد إلى أي درجة توافق على أثر العوامل التالية على تدني كفاءة المراجعين في البيئة المحاسبية الحاسوبيـــة . (فضلاً ضع دائرة على رقم الإجابة المناسبة).

العوامل	لا أوافق بشدة	لا أوافق	محايد	أوافق	اوافق بشدة
أ – قلة التدريب في تقنية المعلومات.	١	٢	٣	٤	٥
ب – التعليـــم غير مناســب (أي أن المناهج في الجامعات والكليات لا تحتوي على أي مواد في تقنية المعلومات وفي المراجعة في البيئة المحاسبية الحاسوبية).	١	٢	٣	٤	٥
جـ – عوامل أخرى (فضلاً حدد)					

الجزء الرابع : خطر المراجعة في البيئة المحاسبية الحاسوبية

٢٠- مـــن فضلك حدد إلى أي مستوى العوامل التالية تساهم في *زيادة خطر المراجعة الكلي* في البيئة المحاسبية الحاسوبية (*فضلاً ضع دائرة على رقم الإجابة المناسبة*)

العامل	مستوى المساهمة في خطر المراجعة					
	لا توجد مساهمة	ضعيفة جدا	ضعيفة	متوسطة	عالية	عالية جداً
أ – *استخدام برامج محاسبية غير مناسبة من قبل العملاء* من حيث عدم مناسبتها لطبـــيعة نشاط العميل، برمجة ضعيفة أو خاطئة، تقديم الحد الأدنى من المعلومات، وجعل متابعة العمليات صعبة.	١	٢	٣	٤	٥	٦
ب – *تدني كفاءة موظفي العميل الذين يتعاملون مع الأنظمة المحاسبية الحاسوبية خصوصـــاً في تقنية المعلومات* من حيث، على سبيل المثال عدم مقدرتـــهم على استغلال مزايا أنظمة تقنية المعلومات وتفادي الأخطاء.	١	٢	٣	٤	٥	٦
جـــ – *عدم كفاية أنظمة الرقابة الداخلية للعميل في الأنظمة المحاسبية الحاسوبية* من حيث، على سبيل المثال، عدم وجود كلمة سر، وقلة الفصل بين الصلاحيات في تغيير البيانات.	١	٢	٣	٤	٥	٦
د – *اســـتخدام طريقة للمراجعة حول الحاسب* حيث المراجعين يفحصون فقط المدخلات والمخرجات بينما تـــهمل المعالجة التفصيلية داخل الحاسب.	١	٢	٣	٤	٥	٦
و – *تدني كفاءة المراجعين الذين يراجعون الأنظمة المحاسبية الحاسوبية خصوصاً في تقنـــية المعلومات* من حيث ،على سبيل المثال عدم مقدرتـــهم على استخدام وسائلالمراجعة باستخدام الحاسب (CAATs) وإدراكهم للمشاكل والمخاطر المصاحبة لهذه الأنظمة.	١	٢	٣	٤	٥	٦

٢١– مـــن فضلك رتب ما تعتبره *أهم العوامل* التي تساهم في *زيادة خطر المرجعة الكلي* في البيئة المحاسبية الحاسوبية. (وذلك با عطا *أهم عامل رقم ١ ، ثاني عامل من حيث الأهمية رقم ٢ ، وهكذا حتى رقم ٥ لأدنى عامل من حيث الأهمية*) .

العامل	الرتبة
أ – استخدام برامج محاسبية غير مناسبة من قبل العميل .	
ب – تدني كفاءة موظفي العميل الذين يتعاملون من الأنظمة المحاسبية الحاسوبية ، خصوصاً في تقنية المعلومات.	
جـــ – عدم كفاية أنظمة الرقابة الداخلية للعميل في البيئة المحاسبية الحاسوبية.	
د – استخدام طريقة المراجعة حول الحاسب.	
هـــ – *تدني كفاءة* المراجعين الذين يراجعون أنظمة محاسبية حاسوبية ، خصوصاً في تقنية المعلومات.	

الجزء الخامس : تعليقات أخرى

الأخ الكريم : إذا كنت ترغب في التعليق أو الإضافة على أي من المواضيع التي قدمت في الاستبيان ... فالرجاء عدم التردد في كتابة ذلك فيما يلي .

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إذا ترغب في الحصول على ملخص لنتائج هذا الاستبيان ، فضلاً أكمل البيانات أدناه : –

الاســـم : ..... الفاكـــــــس : .....

الشركة : ..... الهاتـــــــــف : .....

العنوان : ..... البريد الإلكتروني : .....

شكرا جزيلا على التفضل بتعبئة هذا الاستبيان، فضلا تأكد من اجابتك لجميع الأسئلة ثم أعده بواسطة الفاكس أو البريد.

بسم الله الرحمن الرحيم

KINGDOM OF SAUDI ARABIA
Ministry of Higher Education
Imam Muhammad Ibn Saud
Islamic University

المملكة العربية السعودية
وزارة التعليم العالي
جامعة الإمام محمد بن سعود الإسلامية

Appendix 5.8 A Sample of the English Version of the Cover Letter for the Main Questionnaire Participants

Dear Participant:

I am a postgraduate student from the Accountancy Department at Imam University. I am currently undertaking PhD research on "***The influence of information technology on audit risk***" under the supervision of Dr. Andrew W. Higson in the Business School at Loughborough University in the UK.

Given the developments in accounting systems, the questionnaire enclosed seeks to elicit opinions about how auditors audit IT-based accounting systems. I should stress that the questionnaire is **not** concerned with the use of information technology by auditors in the administration of the audit (e.g. planning, controlling and recording of audit work etc.).

Your response to the questionnaire will be treated in the strictest confidence and no comments will be attributed to firms. If you would like to receive a summary of the results, please complete the address at the end of the questionnaire.
Your participation in the research is vital to the successful completion of this study and is greatly appreciated.

Yours sincerely,
Abdullah Al-Fehaid

بسم الله الرحمن الرحيم

KINGDOM OF SAUDI ARABIA
Ministry of Higher Education
Al-Imam Muhammad Ibn Saud
Islamic University

المملكة العربية السعودية
وزارة التعليم العالي
جامعة الإمام محمد بن سعود الإسلامية

Appendix 5.9 A Sample of the Arabic Version of the Cover Letter for the Main Questionnaire Participant

المكرم وبعد

السلام عليكم ورحمة الله وبركاته

أفيدكم بأنني أحد مبتعثي جامعة الإمام محمد بن سعود الإسلامية لدراسة الدكتوراه في تخصص المحاسبة في جامعة لفبرا (Loughborough University) في بريطانيا تحت إشراف الدكتور Andrew Higson، وموضوع رسالة الدكتوراه هو "**أثر تقنية المعلومات على خطر المراجعة**"، حيث أن تسجيل المنشآت لبياناتها في الحاسب الآلي بدلا من النظام اليدوي يعد من أهم التطورات في مجال المحاسبة في السنوات الأخيرة. ***لذا هذه الدراسة تبحث في كيفية تعامل المحاسبين القانونين مع الأنظمة المحاسبية الحاسوبية للعملاء وأيضا المصاعب التي تواجههم في هذه البيئة***. ويجب الإشارة إلى أن هذه الدراسة **لا تبحث** في كيفية استخدام الحاسب الآلي بواسطة المراجعين في الأعمال الإدارية في مكاتب المراجعة (مثلا استخدام المراجعين للحاسب في عملية التخطيط للمراجعة، حفظ البيانات، و المساعدة في القيام ببعض العمليات الحسابية و التحليلية اللازمة في عملية المراجعة).

واقتضى الأمر استخدام الاستبيان أداة أساسية لجمع البيانات في هذا البحث، ووقع الاختيار على مكتبكم كأحد أفراد عينة الدراسة لما لكم من سمعة طيبة في تشجيعكم للبحث العلمي وأيضا حسن تعاونكم مع الباحثين. لذا أمل التكرم بالإجابة على الأسئلة المرفقة بصورة دقيقة نظرا لأن أجابتكم سيكون لها قيمة و تأثير على نتائج هذه الدراسة.

أنني بدون مساعدتكم ودعمكم سأجد نفسي عاجزا عن تحقيق أهداف الدراسة. و أؤكد لكم أن أجابتكم سوف تعامل في غاية السرية وللأغراض العلمية فقط ولن يتم الإشارة في هذا البحث إلى أشخاص أو مكاتب معينة. واعدكم بإرسال تقريرا ملخصا عن نتائج الدراسة إذا رغبتم في ذلك.

شاكرين لكم حسن تعاونكم والله يحفظكم ويرعاكم

أخوكم

عبدا لله بن محمد الفهيد

Appendix 5.10 A Sample of the English Version of the Cover Letter for the Pilot Questionnaire Participants

Dear Participant:

I am a postgraduate student from the Accountancy Department at Imam University. I am currently undertaking PhD research on "***The influence of information technology on audit risk***" under the supervision of Dr. Andrew W. Higson in the Business School at Loughborough University in the UK.

Given the developments in accounting systems, the questionnaire enclosed seeks to elicit opinions about how auditors audit IT-based accounting systems. I should stress that the questionnaire is **not** concerned with the use of information technology by auditors in the administration of the audit (e.g. planning, controlling and recording of audit work etc.).

Carrying out this research has required the use of the questionnaire as an instrument for collecting the data for this study. Your firm was chosen because of its good reputation in encouraging academic research and also its positive co-operation with researchers. I would be grateful if you could answer this questionnaire referring to the following:

1- If there were any unclear or ambiguous questions (please mention the revised questions if possible).
2- If there were any questions that should be added (please mention them).
3- If there were any questions that should be deleted (please mention the reason).
4- Please indicate approximately how long it took to fill in the questionnaire (the time that is expected to fill in this questionnaire is less than 15 minutes).

Your response to the questionnaire will be treated in the strictest confidence and no comments will be attributed to firms. If you would like to receive a summary of the results, please complete the address at the end of the questionnaire.
Your participation in the research is vital to the successful completion of this study and is greatly appreciated.

Yours sincerely,
Abdullah Al-Fehaid

بسم الله الرحمن الرحيم

(INGDOM OF SAUDI ARABIA
Ministry of Higher Education
l-Imam Muhammad Ibn Saud
Islamic University

المملكة العربية السعودية
وزارة التعليم العالي
جامعة الإمام محمد بن سعود الإسلامية

Appendix 5.11 A Sample of the Arabic Version of the Cover Letter for the Pilot Questionnaire Participants

المكرم وبعد

السلام عليكم ورحمة الله وبركاته

أفيدكم بأنني أحد مبتعثي جامعة الإمام محمد بن سعود الإسلامية لدراسة الدكتوراه في تخصص المحاسبة في جامعة لفبرا (Loughborough University) في بريطانيا تحت إشراف الدكتور Andrew Higson، وموضوع رسالة الدكتوراه هو **"أثر تقنية المعلومات على خطر المراجعة"**، حيث أن تسجيل المنشآت لبياناتها في الحاسب الآلي بدلا من النظام اليدوي يعد من أهم التطورات في مجال المحاسبة في السنوات الأخيرة. ***لذا هذه الدراسة تبحث في كيفية تعامل المحاسبين القانونين مع الأنظمة المحاسبية الحاسوبية للعملاء وأيضا المصاعب التي تواجههم في هذه البيئة***. ويجب الإشارة إلى أن هذه الدراسة **لا تبحث** في كيفية استخدام الحاسب الآلي بواسطة المراجعين في الأعمال الإدارية في مكاتب المراجعة (مثلا استخدام المراجعين للحاسب في عملية التخطيط للمراجعة، حفظ البيانات، و المساعدة في القيام ببعض العمليات الحسابية و التحليلية اللازمة في عملية المراجعة).

واقتضى الأمر استخدام الاستبيان أداة أساسية لجمع البيانات في هذا البحث، ووقع الاختيار على مكتبكم لما لكم من سمعة طيبة في تشجيعكم للبحث العلمي وأيضا حسن تعاونكم مع الباحثين. لذا أمل التكرم بالإجابة على هذا الاستبيان مع الإشارة للأتي:

١- إذا كان هنالك أسئلة / بيانات غير واضحة وبالتالي يجب إعادة صياغتها (فضلا اذكر الصيغة البديلة ما أمكن).
٢- ا كان هنالك أسئلة / بيانات ينبغي أضفتها (فضلا اذكرها).
٣- ا كان هنالك أسئلة / بيانات ينبغي حذفها (فضلا اذكر السبب).
٤- الوقت المستغرق في الإجابة على هذا الاستبيان (إجابة هذا الاستبيان يتوقع أن لا تتجوز ١٥ دقيقة، إذا استغرق أكثر من ذلك فضلا اذكر المدة).

أنني بدون مساعدتكم ودعمكم سأجد نفسي عاجزا عن تحقيق أهداف الدراسة. و أؤكد لكم أن أجابتكم سوف تعامل في غاية السرية وللأغراض العلمية فقط ولن يتم الإشارة في هذا البحث إلى أشخاص أو مكاتب معينة. واعدكم بإرسال تقريرا ملخصا عن نتائج الدراسة إذا رغبتم في ذلك.

شاكرين لكم حسن تعاونكم والله يحفظكم ويرعاكم

أخوكم

عبدا لله بن محمد الفهيد

Appendix 5.12: The Normality Test for the Research Variables					
Variables	***Skewness***	***S.E. of Skewness***	***Kurtosis***	***S.E. of Kurtosis***	***Normality****
Lack of competence of client's staff in dealing with ITBAS	-0.495	0.285	0.874	0.563	Normal
The unsuitability of client's accounting software	-0.835	0.287	0.903	0.566	Normal
Lack of client's staff training in IT	-1.304	0.285	3.029	0.563	Normal
Lack of education in IT of client's staff	-0.897	0.285	1.950	0.563	Normal
Lack of understanding of IT of the client's management	-0.335	0.285	-0.281	0.563	Normal
Client's financial cost concern	-1.582	0.285	2.361	0.563	Normal
Level of inherent risk	-1.795	0.285	4.569	0.563	Normal
The weakness of the client's internal control systems	0.004	0.285	-0.736	0.563	Normal
Level of control risk	-1.496	0.285	1.739	1.739	Normal
Lack of competence of auditors in auditing ITBAS	-0.441	0.289	-0.816	0.570	Normal
Lack of IT training for auditors	-1.231	0.289	1.737	0.570	Normal
Lack of auditor's education in IT	-0.367	0.287	-0.491	0.566	Normal
The audit firm's financial cost concern	-0.761	0.285	0.233	0.563	Normal
Inappropriateness of the Saudi audit standard to ITBAE	-0.611	0.291	0.576	0.574	Normal
The use of auditing around the computer approach	-1.267	0.287	-1.267	0.566	Normal
Level of detection risk	-0.712	0.285	0.683	0.563	Normal

Keys to the Table:

S.E.: Standard Error

ITBAS: IT-based Accounting Systems

ITBAE: IT-based Accounting Environment

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* Generally speaking, there are few clear guidelines about the interoperation of the absolute values of univariate skew and kurtosis indexes. However, there are some suggestions reported by some academic writers based on previous studies. For instance, Kline (1998, p. 82) stated that "*Data sets with absolute values of univariate skew indexes greater than 3.0 seem to be described as "extremely" skewed ... however, absolute values of univariate kurtosis index from 8.0 to over 20.0 have been described as indicating "extreme" kurtosis*".